

- 5.1.2 Critical Path Activities: Identify critical path activities, including those for interim completion dates. Clearances, Utility interruptions, relocation, and connections affecting overall operations including Permits.
- 5.1.3 Provide information for each significant activity, with special care taken to describe scheduling and coordination with other contracts, Work by PG&E, and others, including but not limited to utility shutdowns (Clearances), road closures, etc.
- 5.2 The Project Baseline shall be updated by Contractor on a weekly basis.
 - 5.2.0 Schedule Updates shall be a three to six week "Look Ahead Schedule," detailed daily using the Critical Path Method (CPM). Schedule shall be updated and issued weekly. (Computer Generated file must be submitted to PG&E weekly). Look Ahead Schedule shall cover a Six week period, beginning with the week preceding the 6-week detailed look ahead. Actual Start and Finish Dates must be provided. Show remaining duration.
 - 5.2.1 Show the status of all outstanding and pending submittals including scheduled and actual submittal dates, the durations and expiration of submittal review periods, etc.
 - 5.2.2 The Contractor shall provide full access to electronic schedule files by e-mail for the PG&E Project. The file to be saved as an xml file for data transfer along with scheduling software file. These files shall be submitted weekly to PG&E.
- 5.3 RECOVERY SCHEDULE
 - 5.3.0 If the Schedule Update or Look Ahead Schedule shows Project completion or any individual milestone date beyond the Contract Completion, The Contractor shall within five (5) days, submit to PG&E a Recovery Plan to recover the lost time. The Recovery Plan shall also describe how the contractor intends to regain schedule compliance without additional cost to PG&E.
- 5.4 REQUIRED COMPLETION DATE: As specified in the applicable CWA.
 - 5.4.0 Contractor shall communicate any anticipated delay in completing Work to the PG&E Representative. If requested by PG&E, Contractor shall submit a recovery plan.
- 6.0 CONSTRUCTION/WORKSITE FACILITIES
 - 6.1 ROADS AND RAMPS: Contractor may only use authorized means of access and shall maintain same to the satisfaction of PG&E.
 - 6.1.0 Traffic on PG&E owned or leased property will be strictly controlled. Traffic regulations will be enforced. PG&E expects Contractor to exercise exceptional care in the use of roads. Any damage beyond the normal wear and tear of everyday traffic resulting from the activities of Contractor or its Subcontractors shall be repaired by Contractor or at Contractor's expense. Conduct of traffic on the access road or other PG&E roads is subject to the control of PG&E. Any misuse of these facilities can result in the withdrawal of use privileges from any of Contractor's employees.
 - 6.1.1 Contractor shall take all precautions necessary to protect existing pavement, dikes, drainage structures and other facilities. Contractor shall be responsible for damage caused by its neglect or negligence.

- 6.2 **PARKING:** Unless otherwise stated in writing, no parking facilities are available at the Work site for Contractor's employees. No vehicles other than those on official business will be permitted to park in the substation areas except as otherwise authorized by PG&E.
- 6.3 **WATER:** No water will be available at the site. Contractor must make provision for potable or non-potable water necessary to perform the Work hereunder.
- 6.4 **POWER:** Contractor shall provide all necessary electrical power for tools and equipment.
- 6.5 **SANITARY CONVENIENCES:** Contractor shall provide sanitary conveniences and remove them upon completion of the Work. Conveniences shall comply with applicable governmental regulations.
- 6.6 **TELEPHONE FACILITIES:** There are no existing telephone facilities at the Work site which can be made available to Contractor. Contractor shall make all necessary arrangements for such facilities. At Contractor's expense, Contractor shall have cellular phones and pagers on site for safety and to facilitate contact by PG&E personnel.
- 6.7 **JOBSITE CONDUCT:** Contractor is responsible for its employees' conduct and will be held liable for all costs related to their misconduct. Contractor shall respect the rights of the general public and especially PG&E's customers at all times. Contractor shall strive at all times to be courteous to all customers affected by the Work performed under this Contract as well as all members of the general public. Contractor shall ensure that the conduct of its employees or Subcontractor's employees is of a professional manner and shall not allow its employees to play radios, use profanity, use abusive language or display gestures which could be interpreted by the customer or general public as offensive or obscene.
- 6.7.0 Conflicts between the general public (specifically PG&E's customers) and the Contractor's or Subcontractor's employees will not be tolerated. If the PG&E Inspector or the PG&E Representative finds any Contractor's or Subcontractor's employees to be unsatisfactory or unfit, Contractor or Contractor's representative shall replace said employee immediately. Said employee is to be immediately removed from the project and excluded from the job site(s). It is understood that this provision in no way requires the Contractor or Subcontractor to terminate the employment of any employee replaced under the terms of this Section 1 Paragraph 6.7 of the Specific Conditions. Nor, by the terms of this Section 1 Paragraph 6.7 of the Specific Conditions, does PG&E expressly or impliedly endorse or approve the termination of employment with the Contractor or Subcontractor of any employee replaced under the terms of this Section 1 Paragraph 6.7 of the Specific Conditions.
- 6.7.1 No persons performing Work shall keep firearms, bow and arrows or any projectile firing implements on their person or in their vehicles. The use or possession of alcoholic beverages or illegal drugs is prohibited during performance of Work for PG&E. Violations of any of these requirements by any person will be grounds for the removal of that person from the job.
- 6.7.2 Contractor's employees, agents and Subcontractors shall abide by the Drug and Alcohol Abuse Policy (Exhibit 4) stated in the Construction General Conditions.
- 6.7.3 Contractor's personnel shall not trespass on private property. Contractor must obtain permission from the landowner prior to entering private property.



- 6.7.4 Contractor shall not bring any individual onto the Work site, other than Contractor's employees unless authorized in writing by PG&E.
- 6.7.5 Violations of Jobsite Conduct requirements by any Contractor will be grounds for removal.
- 6.8 **LANDS FOR CONSTRUCTION PURPOSES**
 - 6.8.0 PG&E will provide lands and rights-of-way necessary for the Work.
 - 6.8.1 Contractor shall fully inform itself of, and shall comply with regulations and orders of governmental authorities which may affect the conduct of the Work hereunder, particularly in regard to disposal of waste material and clearing or burning of combustible material. Contractor shall remove its waste from Work sites.
 - 6.8.2 Contractor shall limit the activities and operations of its employees and Subcontractors to the construction boundaries of the area designated by PG&E.
 - 6.8.3 Contractor shall reimburse PG&E for any payments made to the owners involved for any damages to adjacent property resulting from actions of Contractor, its employees or Subcontractors.
 - 6.8.4 Contractor shall not directly negotiate or enter into any agreements with adjacent property owners. Any desired communication between Contractor and adjacent property owners shall be through PG&E.
- 6.9 **GOOD HOUSEKEEPING:** Contractor shall maintain clean and orderly Work and storage areas during the progress of its Work.
 - 6.9.0 Contractor shall maintain the Work area in a clean condition and shall remove waste material and rubbish from the Work area immediately as it accumulates or as directed by PG&E. Contractor shall comply with all state, local and federal laws governing handling of hazardous materials or waste.
 - 6.9.1 Material supplies stored in Work areas shall be neatly, safely and securely stored as appropriate to the material and as approved by PG&E.
 - 6.9.2 Upon completion of Work at the Work Site, Contractor shall remove tools, construction equipment, waste material and rubbish from the Work site and shall leave the area in a clean and orderly condition.
- 6.10 **REMOVAL OF TEMPORARY FACILITIES:** At the completion of a specific block of Work or as directed by PG&E, its temporary construction facilities shall be removed to the satisfaction of PG&E.
 - 6.10.0 Contractor shall provide required office, storage, shop and lay-down area for Subcontractor's for which it is responsible during the performance of Work from areas assigned for Contractor's occupancy. No additional areas will be allowed for occupancy by Subcontractor's activity without the specific approval of PG&E.
- 6.11 **AIRBORNE DUST:** Contractor shall control airborne dust on its outside work areas to meet local, state or federal regulatory requirements or as directed by PG&E. Contractor shall be responsible for any damage or additional maintenance expenses incurred by PG&E or others which result from airborne dust from Contractor's operation.
- 6.12 **SPECIFIC AREAS:** Within the work site, an area will be assigned to Contractor for its office, material storage and material lay down, unless otherwise stated in writing. Under



no circumstances shall Contractor be allowed to occupy other areas without specific authorization of PG&E.

- 6.13 EQUIPMENT, TOOLS AND LABOR: Contractor shall provide all equipment, tools and labor necessary to complete the assigned Work. Tools and equipment shall be in good repair and efficient operating condition.

6.13.0 Contractor shall be responsible for the security and well-being of its own equipment and tools.

6.13.1 Contractor is required to use only those tools and equipment that are properly calibrated and current to applicable testing schedules.

- 6.14 ADDITIONAL PRECAUTIONS: If the PG&E Inspector requests Contractor to provide certain safeguards not in use but considered necessary and if Contractor fails to comply with the request within a reasonable time, PG&E may provide the safeguards at Contractor's expense. Failure to comply with safety precautions required by the PG&E Inspector may result in termination of the Contract per the General Conditions.

7.0 ELECTRIC DISTRIBUTION AND CIVIL CONTRACTORS UTILIZATION OF PG&E YARDS

To achieve efficiencies, PG&E has made PG&E yards available for Contractor's use. Contractor shall follow the guidelines for use of these yards as set forth in Attachment D, Requirements for Contractor Utilization of PG&E Facilities.

- 7.1 For those yards which are acquired by the Contractor, and for which PG&E delivers material to, Contractor shall comply with the yard size guidelines for material delivery access as described in Section 2 Paragraph 3.0 of the Specific Conditions.

- 7.2 In addition to other requirements in this specification, Contractor shall:

7.2.0 Provide 24/7 contact information and access to Contractor's equipment in the PG&E yard in case of emergency.

7.2.1 Adhere to all safety standards and guidelines including those contained in Supplier Quality Assurance Quality Management Manual (SCM-2100M).

7.2.2 Follow the yards operational procedures. (Unique to and provided individually by each yard).

7.2.3 Adhere to the good housekeeping; laydown and staging yard; hazardous material permitting, and hazardous materials and waste storage, handling, and disposal requirements.

- 5 Minute Meeting – Environmental Release to Construct (ERTC) Package Changes
- Electric Distribution General Best Management Practice (BMP) ERTC Attachment Guide Package Sections 1 to 5
- Electric Distribution Frequently Used Storm Water Activity Specific Erosion and Sediment Control Plan (A-ESCPs) and BMPs ERTC Attachment Guide Package Sections 6 and 7
- Electric Distribution Infrequently Used Storm Water AESCPs and BMPs ERTC Attachment Guide Package Section 8

7.2.4 Be responsible for any damage to the yard including but not limited to damage to drivable surfaces above and beyond wear due to normal use.



- 7.2.5 Perform no maintenance or repairs of any kind on any equipment in PG&E's yard.
- 7.2.6 Perform no fueling operations within the yard.
- 7.2.7 Retain responsibility and risk of loss, theft or injury for any and all equipment, material or employees while in PG&E's yard except for actual damages or loss of Contractor's equipment directly attributable to PG&E's gross negligence.
- 7.2.8 Be responsible for the safety, performance and conduct of its employees regardless of location and as otherwise noted in this specification.
- 7.2.9 Obtain environmental approval from the PG&E Project Manager before occupying the yard.
- 7.3 Contractor awarded specific territory(ies) will be provided the applicable documents referenced in the protocols for each of the PG&E Maintenance and Construction Yard(s) made available to Contractor as part of Attachment D.

8.0 QUALITY ASSURANCE AND QUALITY CONTROL

PG&E shall have full authority to conduct construction tests and inspections and exercise such control as required to ensure that the Work is in full compliance with this Specification. Material supplied by Contractor not meeting requirements set forth by PG&E shall be removed from the job site at Contractor's expense and replaced with material that complies with requirements set forth by PG&E and the design drawings.

- 8.1 Contractor shall be responsible for the quality of Work performed. The protocol for quality assurance of work performed by Contractor is outlined in the Supplier Quality Assurance, Quality Management Manual (SCM-2100M).
- 8.2 PG&E Company Representative will provide inspection services to verify acceptance of the Work.
- 8.3 Neither the making nor the failure to make tests or inspections by PG&E or the expressed or implied approval by PG&E of any part of the Work shall relieve the Contractor of his responsibility to complete and guarantee the Work as specified.
- 8.4 Rejected Work or defective materials if supplied by Contractor shall be remedied as directed by PG&E at the expense of the Contractor.
- 8.5 Any testing performed by PG&E does not prevent the Contractor from conducting its own tests.

9.0 SAFETY

- 9.1 **GENERAL:** Contractor is responsible for compliance with all applicable federal, state and local requirements, including but not limited to, all safety requirements mandated by the Safety Orders of the California Division of Occupational Safety and Health and as stated under Paragraph 13.1, Regulations and Conduct of Work, of the Construction General Conditions. Contractor shall also comply with electric utility industry standards including, but not limited to, applicable American Society of Testing and Material (ASTM) and American Standards National Institute (ANSI) standards.
 - 9.1.1 PG&E may at times, require additional provisions and specific work procedures when working on PG&E facilities which have been deemed to further protect the safety of electrical and civil workers, the public and PG&E's facilities.



- 9.1.2 Incident reporting guidelines to be completed following the first priority of making the situation safe and/or requesting emergency services are contained in Attachment C, Safety Incident, Work Procedure Error and Planned Outage Reporting Guidelines, and for which the contractor shall follow in the event of all injuries to their employees and the public, property damage and any Work Procedure Errors (WPE's). Within 1 (one) hour verbal or email notification is required, followed by an Incident Report (IC) within twenty-four (24) hours and an Apparent Cause Evaluation (ACE) report within seventy-two (72) hours as specified in Attachment C.
- 9.1.2.1 For any incidents resulting in customer property damage, for which the Contractor has involvement, the Contractor shall take immediate action to manage the incident with all customers involved and sustain management of the incident to its final resolution. Contact with the customers is mandatory.
- 9.1.3 In addition to any other requirements specified in this Contract including in Attachment C, should there be a serious incident causing an injury, fatality or significant damage to equipment during the performance of Work, Contractor shall provide to PG&E a report within two (2) weeks of the incident that describes the root cause of the injury, fatality or significant damage and that provides corrective actions. Such report shall be performed by an independent third party and paid for by Contractor.
- 9.1.4 Contractor is solely responsible for the safety of its operators, equipment and machinery.
- 9.1.5 Contractor shall prepare any necessary job-specific Work Plans and Health & Safety Plans required for performance of Work and train its employees and Subcontractors in the requirements of such plans prior to commencing any Work. Contractor shall have a safety plan, which shall include training for all Contractor and Subcontractor-supplied labor. Such safety plan shall include, but not be limited to, the requirements of this Paragraph 9.0 and Paragraphs 13.0, Safety Precautions and Protection of Property, 32.0, Hazardous Materials/Hazardous Waste, and 34.3, California Health and Safety Code, of the Construction General Conditions and shall be in addition to, not in lieu of, PG&E's Site Safety Plan. PG&E's Site Safety Plans are site specific and are reviewed with Contractor during the design and approval process of Contractor's job-specific Work Plans and Health & Safety Plans.
- 9.1.6 Contractor shall provide all tools and equipment required for the performance of the Work and to ensure the safety of its employees or Subcontractors. Contractor shall be responsible for ensuring that all its employees and Subcontractors are properly trained and qualified to use such tools and equipment prior to actual use. It shall be Contractor's responsibility to determine if any workspace is defined as confined space. If Contractor determines that any workspace so requires, Contractor shall ensure that confined space training is provided, as required, to its employees and Subcontractors in accordance with all federal, state and local regulations.
- 9.1.7 Contractor is responsible for the safety and adherence to safe work practices of all of its employees and Subcontractors. PG&E may perform regular safety audits; however, the performance of such audit by PG&E does not relieve Contractor of its responsibility for maintaining a safe, clean and orderly work



place. PG&E reserves the right to halt any Work at the site due to safety violations, including inadequate work site protection and traffic control. Work shall not continue until the violations are corrected to PG&E's satisfaction. Additionally, Contractor shall not be granted schedule relief nor charge PG&E for overtime or other costs incurred to return to schedule if Work is halted for safety violations.

- 9.1.8 Before ascending or changing the strain on existing poles, Contractor shall take all steps necessary to ensure that such poles are safe to climb. PG&E has no responsibility for any personal injury or damage to person or property as a result of Contractor's failure to test poles and provide necessary safeguards. Adjacent poles shall also be considered by Contractor.

- 9.2 **CONTRACTOR SITE SAFETY AND HEALTH:** The safety and health items have been identified as possible risks that may be encountered in performing Work. The items listed below do not cover all possible risks. The Contractor is responsible for evaluating all aspects of the Work, including site risks, minimizing or eliminating exposure to those risks and completing the Work in a safe manner.

- 9.2.1 PG&E's receipt of Contractor's emergency action plan, safety plan, environmental plan or any other safety and health related information, does not imply that PG&E endorses the plan. Contractor is solely responsible for performing the Work in compliance with all federal, state, local or other rules and regulations that apply to the Work under this Contract.

- 9.2.2 Hazards may include, but not limited to, clearance procedures, climbing new and old wood poles, energized electrical facilities, high tension cables and wires, underground/overhead utilities, overhead obstructions, helicopter access, aerial lifts, excavations, confined spaces, live gas facilities, chemicals, pesticides, PCB, lead, hazardous materials, emergency conditions, weather conditions, heat illness, noise, vehicular and pedestrian traffic, bees, wasps, snakes, spiders, poison oak/ivy and driving are present for this Work and personal protective equipment, an emergency action plan/communications, safety at height, hazardous waste management and driving are required for this Work. Contractor shall take all precautions necessary to protect all persons (employees of Contractor and PG&E and third parties, including members of the public) and property (of Contractor, PG&E and third parties) from exposure to these risks. At a minimum, Contractor must comply with all federal, state, local or any other laws, rules or regulations that apply to the Work.

- 9.2.2.1 In accordance with all federal, state and local regulations, notice is hereby given that Work may be located in the vicinity of asbestos-containing material. The Contract does not cover direct asbestos work; such work can only be performed by a duly licensed and qualified contractor. If the Work requires Contractor to disturb the fireproofing material or any other material suspected of containing asbestos, Contractor shall cease and contact the PG&E Representative.

- 9.3 **SAFETY PRECAUTIONS:** For all types of Work, Contractor shall have an ongoing Safety Training Program for its employees. Compensation for Safety/First Aid meetings shall be included in the pricing attached herein. There shall be no additional compensation for Contractor employees to attend Safety/First Aid meetings.



- 9.3.1 **CONTRACTOR SAFETY MEETINGS:** Contractor shall conduct field safety meetings at least weekly with all employees, discussing safety items that are relative to the Work in progress.
- 9.3.2 **SAFETY TAILBOARD MEETINGS:** During the course of a job, PG&E may conduct safety meetings on-site to discuss site-specific safety issues and requirements. Contractor shall strictly adhere to these requirements. Contractor shall be solely responsible for maintaining a safe working environment at the job site during the performance of all Work.
 - 9.3.2.1 PG&E has a site safety tailboard specific to the Work location. Subsequent to award of Contract and prior to Contractor commencing any Work hereunder, PG&E's designated on-site representative shall conduct a site-specific site safety tailboard for Contractor's personnel. In addition, Contractor's supervisory personnel shall attend a hazard communication briefing conducted by PG&E's designated on-site representative on the specific hazards associated with the Work related to overhead and underground electrical substructures and any other conditions unique to the site which may be encountered. Contractor shall instruct each subsequently assigned employee or Subcontractor in the site safety tailboard and hazard communication requirements prior to any such employee or Subcontractor performing any Work hereunder. It is Contractor's responsibility to contact the PG&E designated on-site representative to schedule the instruction.
- 9.4 **SAFEGUARDS:** Contractor shall supervise all Work performance to ensure the safety of PG&E employees, the general public and the Contractor's employees and its Subcontractors. Contractor shall plan and conduct the Work to safeguard all persons and property from injury by providing, as appropriate, warning devices, signs, traffic control, barricades, lights, flares, reflector, shoring, bracing, cones, lockout tags and other devices to notify PG&E employees and the general public of Work being conducted.
 - 9.4.1 **CONDUCT OF WORK:** Contractor shall not allow any Subcontractor, agent or employee to become a nuisance or commit acts of vandalism to the premises or lands in the vicinity of the Work.
 - 9.4.2 **COST:** The cost of the Work, including the installation of equipment and facilities required to provide and maintain safe working conditions, shall be included in the pricing attached herein.
 - 9.4.3 **DRIVING VEHICLES:** Contractor shall be responsible for the driving habits of its personnel while within the work area. Narrow roads, steep grades, slippery conditions and heavy vehicular and pedestrian traffic require strict observance of posted speed limits and road hazard warning signs.
 - 9.4.4 **FIRE HAZARDS:** Contractor shall provide appropriate fire safeguards by keeping worksite and its immediate surrounding free of dry brush, weeds, grass, debris and other conditions which may cause fire hazards.
 - 9.4.5 **FIRE REGULATIONS:** Contractor shall comply with the requirements of the California State Division of Forestry Fire Prevention Bureau and the regulations of the Public Resources Code, Section 4167 which governs the use of spark arrester devices on all motorized equipment.
 - 9.4.6 **FIRE DANGER PRECAUTIONS:** FIRE DANGER PRECAUTIONS: Contractor must observe all laws, rules, and regulations of fire agencies having jurisdiction



over areas in which they are working (including work areas within fenced corporation and substation yard areas) per PG&E's Utility Standard TD-1464S on Fire Danger Precautions in Hazardous Fire Areas.

- 9.4.7 **HARD HATS AND PROTECTIVE CLOTHING:** Contractor shall require all personnel to wear hard hats, leather work boots, safety vests and adequate clothing while engaged in Work. Contractor shall furnish its employees with a hard hat of a single color distinct from the color used by any other Contractors at the site and by PG&E.
- 9.4.7.1 PG&E approved metal toe guards shall be worn by workers when operating mechanical tampers or jackhammers.
- 9.4.7.2 Flame Resistant (FR) clothing shall be worn by all workers performing electric Work while engaged in Work for PG&E.
- 9.4.8 **FLAME RESISTANT CLOTHING:** Supplier shall ensure that all Supplier personnel wear FR (Flame Resistant) clothing as defined by the American Society for Testing and Materials standard TM F1506-02a, "Standard Performance Specification for Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards" under any of the following conditions:
- The Supplier's personnel are subject to contact with energized circuit parts.
 - The Supplier personnel's clothing could be ignited by flammable material in the work area that could be ignited by an electric arc, or
 - The Supplier personnel's clothing could be ignited by molten metal or electric arcs from faulted conductors in the work area.
- 9.4.8.1 Supplier shall ensure that that Supplier's personnel wear flame RESISTANT clothing that has an arc rating greater than or equal to the available heat energy and ensure that personnel wear clothing that could not melt or ignite and continue to burn in the presence of electric arcs to which personnel could be exposed as required by the National Electric Safety Code (NESC-IEEE C2-2007). All garments shall have tags visible from the outside that clearly identifies the garment as Flame Resistant (FR) and clearly indicates the arc rating (HRC category) of the garment. All garments shall have a minimum rating of HRC 2.
- 9.4.8.2 All Supplier's personnel requiring access to PG&E Substation facilities or PG&E Power Generation Facilities shall be required, at a minimum, to wear flame RESISTANT clothing (long sleeve shirts, long pants or coverall as required) rated HRC 2 with a minimum rating of 8 cal/cm² for personal protection as required by the PG&E Arc Flash Hazard Control Procedure (SHC 237).
- 9.4.9 **NOISE CONTROL:** Contractor shall make every effort to minimize noise from equipment which will be operating for extended periods of time or during the night.
- 9.4.10 **OPERATION OF SWITCHES:** Contractor shall not open or close any switches on energized equipment or perform any other operations on an approved switch log unless given direction by the PG&E Representative. Contractor will be instructed in the method of PG&E tagging and clearances procedures.



9.4.11 TEMPORARY FENCES AND BARRICADES: Contractor shall provide and maintain all temporary fences and barricades as required for the Work and to safeguard construction materials. When appropriate, barricades equipped with operating flasher lights and/or reflectorized tapes shall be utilized to safeguard all persons and property from injury. Contractor shall remove the above temporary fences and barricades upon the completion of the Work.

9.4.11.1 Barriers: Contractor shall provide and maintain until completion of the Work sufficient barriers, platforms and other safeguards as necessary. Any open augured holes shall be covered at all times with plywood having a minimum thickness of 1 1/8" inches.

9.4.12 TRAFFIC CONTROL: Contractor shall take all necessary precautions for the protection of the Work and the safety of the public. Public roads closed to traffic for the Work shall be protected by the use of qualified flagmen and/or installing effective barricades with proper warning and detour signs attached.

9.4.12.1 Contractor shall bear the cost of furnishing all labor (i.e., watchmen, flaggers, etc.), signals, etc. necessary for the proper and safe performance of the Work.

9.5 RUBBER GLOVING:

9.5.1 Upon request, Contractor shall provide PG&E Representative with the names of employees who have been certified for Rubber Gloving work. At its option, PG&E may verify the certification of Contractor's employees who employ Rubber Gloving methods.

9.5.2 Contractors employing Rubber Gloving methods shall, at a minimum, adhere to the "insulate and isolate" safety rules and practices in Title 8 of the California Code of Regulations, (Cal/OSHA). Nothing herein shall be interpreted as a mandate to weaken or change existing rules or practices.

9.5.3 When working on or adjusting an open device (switches, solid blades, line recloser, etc.) and there is a possibility that a parallel condition can be created between the two circuits, one of the following three options shall be used:

9.5.3.1 Option 1: Move the normal open point to another existing device. The Electric Control Center will direct switching to close the device to be worked on or adjusted and open another existing device, thereby separating the parallel.

9.5.3.2 Option 2: Establish a temporary open point on either side of the device to be worked on. The person in charge determines the location and communicates with the Electric Control Center to request a temporary open point (jumpers or temporary "flying bells") be established on either side of the device to be worked on. Establishing this temporary open point (i.e., jumpers or flying bells) prevents the circuits from being paralleled during operation of the device.

9.5.3.3 Option 3: Use hot stick procedures to perform the work. Using hot stick procedures to work on or make adjustments to a distribution field device (including while circuits are in parallel) is allowed.



9.5.4 **NON-COMPLIANCE WITH Cal/OSHA RUBBER GLOVE SAFETY RULES:** The PG&E Representative has the right to stop the Work immediately if PG&E Representative determines the Work does not comply with Cal/OSHA safety rules. Noncompliance may result in termination of the Contract per the General Conditions.

9.5.4.1 For decades, electrical workers in California have traditionally utilized live-line tools (insulated "hot sticks") to perform energized Work above 7,500 volts, phase-to-phase. Nothing in this Paragraph 9.5 shall prohibit Contractor from exclusively utilizing traditional hot stick methods with qualified electrical workers to do energized Work.

9.6 BLASTING

9.6.1 **USE OF EXPLOSIVES DURING PERFORMANCE OF WORK IS EXPRESSLY PROHIBITED UNLESS SPECIFICALLY AUTHORIZED, IN WRITING, BY PG&E.** In the event Contractor determines that explosives are required in performance of the Work, Contractor shall submit to PG&E a detailed description of the location and nature of the obstruction requiring explosives. If PG&E agrees with Contractor's assessment, PG&E shall provide Contractor, in writing, specific limitations and specifications within which such explosives may be used. **IN NO EVENT SHALL CONTRACTOR PROCEED WITH THE USE OF EXPLOSIVES UNTIL CONTRACTOR HAS RECEIVED SUCH SPECIFICATIONS, IN WRITING, FROM PG&E.** PG&E providing or failing to provide, these specifications does not relieve Contractor of the responsibility to use the explosives safely and in accordance with all federal, state and local laws, rules and regulations.

9.6.2 In the event Contractor uses explosives in the performance of Work, Contractor shall establish the means by which the inventory of such explosives is carefully controlled. Contractor shall document each item brought on site including, but not limited to, caps, powder and primer cord. At the conclusion of the Work requiring use of the explosives, Contractor shall inventory and account for each and every explosive item brought onto the site compared to the inventory of explosive items used or remaining in Contractor's inventory. All unused explosive items shall be removed from the Work site immediately that the Work requiring use of the explosives is completed or on a daily basis whichever is sooner. Absolutely no dangerous materials may be left at the Work site. Contractor shall be responsible for all costs and penalties associated with any incident resulting from Contractor's loss or misuse of any explosive item.

10.0 MOTOR CARRIER OF PROPERTY PERMIT

10.1 Any Contractor who operates either directly or through a Subcontractor, a motor vehicle to transport property in the State of California for compensation and is required to obtain a Motor Carrier of Property Permit ("MCP") as regulated under California Vehicle Code Sections 34600, 34601 and 34620.

10.2 Contractor must have a current MCP to perform the transport services required under this Contract.

10.3 Contractor represents and warrants to PG&E the following:

10.3.0 Contractor has a valid MCP to transport any hazardous waste material, from, to or between all points provided for herein and to perform any related transport services pursuant to this Contract; and Contractor shall immediately provide



PG&E with a true, correct and complete copy of its MCP, which is in full force and effect as of the date of this Contract.

- 10.3.1 If Contactor uses a Subcontractor to transport any hazardous waste material or to perform any other related transport services, Contractor shall immediately provide PG&E with a true, correct and complete copy of its Subcontractor's MCP.
- 10.3.2 Contractor shall immediately notify PG&E in writing of any renewal, suspension, cancellation, termination, withdrawal, modification or transfer of its or any Subcontractor's MCP or any portion thereof and shall promptly furnish PG&E with a true, correct and complete copy of the modified, transferred or otherwise MCP PG&E has on file.
- 10.3.3 Contractor shall not use any Subcontractor to provide transport services, if the Subcontractor's MCP is suspended, cancelled, terminated or withdrawn.
- 10.3.4 In the event PG&E receives notice of a suspension, cancellation, termination, withdrawal, modification or transfer of the Contractor's MCP, PG&E shall have the right to terminate.

11.0 DRAWINGS

- 11.1 Dimensions: Contractor shall be responsible for the verification of all final dimensions at the worksite and shall not depend solely on PG&E or Joint Party drawings that may be provided under a CWA. There may be minor dimensional deviations between existing utility facilities and the Work to be performed under the Contract for PG&E and the Joint Parties. PG&E assumes no responsibility for Contractor's interpretations or conclusions derived from the use of PG&E's or each Joint Party's attached drawings.
- 11.2 Although information shown on the drawings provided under a CWA may indicate certain above ground utilities and drainage ditches and underground foreign lines such as water lines, telephone lines, pipelines, etc., such location and crossing information is only provided to call attention of Contractor to such lines. **NEITHER PG&E NOR THE JOINT PARTIES WARRANT OR GUARANTEE THE ACCURACY OR COMPLETENESS OF SAID INFORMATION.** The construction under or over all foreign lines including those not shown on such drawings or any required relocation of foreign lines or above ground utilities, shall be the sole responsibility of Contractor.
- 11.3 The Job Package will describe the extent of Work and provide detailed information.
- 11.4 PG&E anticipates that minor revisions may be made to "Approved for Construction" drawings, documents and/or the JPA instructions or documents during the course of Work. Changes as such will not necessarily involve any additional cost to the Contractor. At its option, PG&E may furnish Contractor additional material as required by any PG&E revision. Also, where the change involves an increase in costs to the Contractor, PG&E will pay for any such costs that it considers justifiable. Contractor shall credit PG&E for any reduction in Contractor's costs caused by such revisions.
- 11.5 All Work shall comply with PG&E standard drawings. Standard drawings will be issued to Contractor prior to starting Work and will become part of the Contract.
- 11.6 During the progress of Work, any additional drawings or documents PG&E may consider necessary will be furnished to Contractor. Such additional drawings or documents shall be made a part of the Work. Contractor shall not make any claim for "additional Work" when PG&E furnishes supplementary drawings or revised Construction Drawings that



merely show minor changes, give more complete information or show added details of original Work.

- 11.7 All drawings furnished to the Contractor by PG&E shall be returned upon completion of the Contract.

11.8 POST CONSTRUCTION DOCUMENTATION

The Contractor is responsible for the preparation of all post construction documentation. The as-built construction drawings and Job Packages shall contain all red line changes that were made to the job and shall describe the location, footages and dimensions of the installed facilities and changes in material used. Additional requirements are outlined in the Supplier Quality Assurance Quality Management Manual (SCM-2100M).

- 11.8.0 The Contractor shall prepare two sets of "as-built" drawings marked in red. The minimum as-built drawing requirements are:

11.8.0.1 ELECTRIC OVERHEAD AND CABLING

- 11.8.0.1.1 Location, size, type and footage of installed cable and/or overhead conductors.
- 11.8.0.1.2 Location, size and type of poles, anchors, down guys and overhead guys.
- 11.8.0.1.3 Location, type and manufacturer's name plate data of all electrical equipment.

11.8.0.2 ELECTRIC SUBSTRUCTURE

- 11.8.0.2.1 Prior to backfilling, Contractor shall update a minimum of one set of Construction Drawings with the following:

- 11.8.0.2.1.1 All corrected "as-built" dimensions and information.
- 11.8.0.2.1.2 Correct conduit dimensioning, referencing property lines and depth, of all turns, offsets, services, transitions, angles, and risers.
- 11.8.0.2.1.3 Correct lengths of all services (box to meter location).
- 11.8.0.2.1.4 Note locations of bores and test sections.
- 11.8.0.2.1.5 For all dimensions and information that match the original design exactly, Contractor shall verify, by circling in red, the design dimension on Construction Drawings.
- 11.8.0.2.1.6 Contractor shall provide a complete set of corrected "as-built" Construction Drawings to PG&E within 14 calendar days after the completion of installation.

- 11.8.1 All as-built drawings shall be signed by both the Contractor and the PG&E Representative verifying their accuracy.



11.8.2 As a result of completed Work performed in CWA, Contractor shall record any changes in the "as-built" drawings and return the original drawings and a set of "as-built" drawings to PG&E.

11.8.3 Contractor shall make "as-built" Construction Drawings available to PG&E at all times.

12.0 GUARANTEES

12.1 PULLING, TERMINATING, SPLICING, GROUNDING, ANCHORING, GUYING, FRAMING and MATERIAL: In addition to the guarantee provisions specified in the General Conditions, Contractor shall guarantee all workmanship and Contractor supplied material for a period of two (2) years from the date all Work is completed and accepted by the PG&E Representative.

12.2 TRENCHES AND TRENCH MATERIAL: In addition to the guarantee provisions specified in the General Conditions, Contractor shall guarantee all trench workmanship and Contractor supplied material for a period of two (2) years from the date all Work is completed and accepted by the PG&E Representative.

12.3 DATE OF ACCEPTANCE: Except as otherwise stated in writing, the date inscribed on the Daily Inspection Log by the PG&E Representative for completed and approved Work shall be considered the date of acceptance. In the absence of the Daily Inspection Log, the date that the job has been signed off as completed by the Contractor's construction foreman will determine the date of acceptance.

12.4 NOTIFICATION OF DEFECTS: During the two-year guarantee period, PG&E will notify Contractor should PG&E determine that there are defects in workmanship and/or Contractor supplied material. Contractor shall repair or otherwise make good any defects in workmanship and/or Contractor supplied material within thirty (30) working days after notification.

12.5 PG&E REPAIRS OF GUARANTEED WORK: Where PG&E determines that it is not practical for Contractor to repair defective workmanship and/or Contractor supplied material, PG&E reserves the right to make repairs or replacements at the expense of Contractor preserving, as much as possible, available evidence of the cause of the failure. PG&E shall notify Contractor prior to repair or replacement of defective workmanship and/or material.

12.6 During the guarantee period, Contractor shall provide written notice to PG&E of any changes in Contractor's address or phone number, within 10 days of such change.

13.0 ENVIRONMENTAL REQUIREMENTS

13.1 Contractors shall abide by all Environmental Federal, State, and local laws and regulations.

13.2 ENVIRONMENTAL RELEASE TO CONSTRUCTION (ERTC): Construction personnel assigned work activities on all PG&E Distribution projects must comply with all the requirements set forth within the ERTC and attached documents provided to the crew by the PG&E Project Manager. The ERTC provides project specific environmental requirements, resource permit requirements, and refers to the ERTC Attachment Guide sections required to be followed prior to, during, and after construction. The crew is required to read and follow the ERTC instructions, conditions, and attachments prior to work commencing to understand the requirements in their entirety.

13.3 ERTC ATTACHMENT GUIDE: The ERTC Attachment Guide is a compilation of Environmental General Best Management Practices (BMPs). Depending on the nature of each project, only



sections of the ERTC Attachment Guide will apply. The ERTC will identify which sections of the ERTC Attachment Guide are applicable for each project. The sections identified in the ERTC shall be reviewed and followed prior to construction.

14.0 CONSTRUCTION NOTIFICATION TO CUSTOMERS AND PROPERTY OWNERS

Upon PG&E's request, Contractor shall inform property owners about upcoming electric system Work to all PG&E customers and community residents who could conceivably be inconvenienced by Contractor's Work. Contractor shall be compensated for such additional Work in accordance with the rates set forth in Contract. Construction Notification shall be distributed two (2) to six (6) weeks before job site Work begins and shall precede distribution of planned electric service interruption notices described below. This notification is not for electric planned outages.

15.0 ELECTRIC CLEARANCES AND CUSTOMER NOTIFICATION

Contractor shall submit all primary clearance and customer outage applications utilizing the Attachment E Contractor Work Checklist to the PG&E representative for approval twenty one (21) days prior to when needed. The Contractor Work Checklist, Attachment E, is contained in the attachments. All planned outages must be pre-approved by the PG&E Contract and Construction Management department. Unless otherwise authorized by the PG&E Contract and Construction Management Department, all customer notifications for electric planned outages must follow PG&E Utility Standards S1418 Notice to Customers, Scheduled Electric Service Interruptions and Utility Standard Talking Points for UO Standard S1418.

- 15.1 Tools, test equipment and grounds intended to be used in conjunction with a clearance shall be made available for inspection and approval by PG&E Representative prior to the clearance date. Contractor shall consult with the PG&E Representative to ensure that Contractor's personal protective grounds are capable of withstanding the maximum fault current for the circuits to be grounded.
- 15.2 Contractor shall de-energize or energize electric facilities only in the proximity of the Work area and only to the extent deemed necessary by PG&E Representative. Contractor shall not, in any event, take any action intended to de-energize, energize, open, close, separate, place in standoff, ground or test any portion of PG&E's electric facilities without explicit prior authorization from PG&E Representative.
- 15.3 Contractor is responsible for cable phasing, voltage checks and motor rotation checks as specified by the PG&E switching tag or as required by the PG&E Representative. Operation shall be verified by the PG&E Representative.
- 15.4 Contractor is not responsible for the costs of PG&E labor and lost revenue associated with electrical switching and electrical clearances to energize or de-energize PG&E facilities except that Contractor will be billed for all time expended and equipment used by PG&E employees in connection with clearances obtained and not utilized by the Contractor, unless sufficient notice of cancellation is given to PG&E. PG&E will determine what constitutes sufficient notice on a case-by-case basis. Such amount may, at PG&E's discretion, be deducted from the amount due the Contractor.
- 15.5 At all times, Contractor shall maintain the electrical facilities in the Work area in such a manner that the facilities could be returned to PG&E's service (energized) within eight (8) hours, should PG&E's operating requirements demand.
 - 15.5.1 Upon notification by PG&E Representative, Contractor shall immediately commence Work necessary to return the facilities to operational status and shall complete the Work within the required 8 hours. Contractor's unscheduled Work, such as direction to return the facilities to operation, shall be defined as Additional Work and shall be compensated in accordance with the Specific



Conditions. Should PG&E decide that an emergency situation exists, PG&E has the right to assist or supplement Contractor's personnel to place the facilities in service as expeditiously as possible.

16.0 USE OF AIRCRAFT

Should Contractor need the use of aircraft in the performance of Work, Contractor and its Subcontractor shall comply with the following provisions including, but not limited to:

- 16.1 COMPLIANCE: Contractor shall, without cost to PG&E, comply with all federal, state, and local laws and regulations and shall obtain and keep in current effect all necessary licenses, fees, and permits required for the conduct of its business and the performance of the Work. All aircraft used in the performance of this Contract shall be operated in accordance with all applicable laws, rules and regulations, including without limitation those of the Federal Aviation Administration (FAA) and the California State Commission of Aeronautics.
- 16.2 Any aircraft that performs work on any PG&E asset, operates on any PG&E property or operates in any PG&E airspace must have onboard a PG&E tracking device. The tracking device must be activated and fully functional any time that the aircraft is operating and billing time to or for PG&E.
- 16.3 AUTHORITY: The aircraft operator shall have full and complete authority over the actual operation of the aircraft, and no flight or landing shall be made, or made in any particular manner, unless in each instance the operator or other representative in charge is satisfied, in that person's sole judgment, of the safety of the proposed flight or landing.
- 16.4 AIRCRAFT SERVICES WARRANTY: Contractor warrants that all aircraft and other equipment and material used or furnished by Contractor in performing the Work are free of defects and are fit for their intended purpose. Neither acceptance of the Work by PG&E nor payment therefore, shall relieve Contractor from responsibility for the Work hereunder.
- 16.5 FLIGHT QUALIFICATIONS: The Contractor warrants that during the term of this Contract, Contractor or its Subcontractor, as the case may be, shall remain qualified to perform the Work and that the helicopter/fixed-wing aircraft to be used by Contractor shall be qualified for the Work hereunder. Qualifications include, but are not limited to, certification by the U.S. Federal Aviation Administration (FAA) under Federal Aviation Regulations (FAR) Part 135 and Part 133.
 - 16.5.1 Each helicopter pilot performing Work hereunder shall hold a valid FAA Commercial Pilot Certificate and a Second Class Medical Certificate, and shall also hold a current and valid authorization by the FAA to conduct operations as pilot-in-command in helicopters under FAR Part 135 and FAR Part 133 (Class A and/or Class B external load operations).
 - 16.5.2 Before the beginning of each flight day, all pilots are required to call the PG&E Helicopter Operations Dispatch Center to receive a preflight safety briefing.
 - 16.5.3 At the end of each day's work, all pilots are required to check in with the PG&E Helicopter Operations Dispatch Center.



16.5.4 PG&E Helicopter Operations Dispatch Center monitors all helicopter operations and fixed-wing patrols. The contact number is 707-449-5833.

16.6 U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS

16.6.1 Contractor and its Subcontractors, as the case may be, shall comply with the U.S. Department of Transportation's (DOT) regulations for (i) commercial motor vehicle drivers, 49 CFR 382, Controlled Substances and Alcohol Use and Testing and (ii) work on gas, hazardous liquid and carbon dioxide pipelines, and liquefied natural gas pipelines, 49 CFR Parts 192, 193 or 195, Control of Drug Use in Natural Gas, Liquefied Natural Gas and Hazardous Pipeline Operations. Contractor shall establish and maintain a drug and alcohol testing program for its employees consistent with 49 CFR Part 40, Procedures for Transportation Workplace Drug Testing Programs and 49 CFR 199, Drug and Alcohol Testing, as applicable. Contractor shall ensure that any Subcontractor hired by Contractor to perform any portion of the Work that is regulated by 49 CFR 192, 193, 195 or 382 shall also have a drug and alcohol testing program that complies with applicable DOT requirements.

16.6.2 PG&E's duly authorized representatives, the California Public Utilities Commission, DOT and appropriate agencies shall have, during the term of the Contract and for two years thereafter, access at all reasonable times to Contractor's drug and alcohol testing program records for the purpose of monitoring compliance with DOT regulations. Contractor shall ensure that any Subcontractor hired by Contractor to perform any portion of the Work regulated by 49 CFR Part 192, 193, 195 or 382 shall also provide access to its drug and alcohol testing program records to PG&E's authorized representatives, the California Public Utilities Commission, DOT and appropriate agencies for the purpose of monitoring compliance with DOT regulations. Failure to comply with this requirement may, at PG&E's option, result in cancellation or termination of existing contracts and the loss of opportunity to bid on future contracts.

16.7 AIRCRAFT INSURANCE COVERAGE. In addition to the insurance requirements in the General Conditions, if the scope of Work involves the use of aircraft, Contractor shall provide, or shall ensure that its Subcontractor provides, the following coverage.

16.7.1 AIRCRAFT LIABILITY: Coverage shall be maintained for bodily injury, property damage, including injury sustained by any passenger, applying to all aircraft owned, furnished or used by the Contractor or its Subcontractor, as the case may be, in the performance of this Contract. The limit shall be at least \$5,000,000.00 each occurrence and in the aggregate for bodily injury and property damage including passenger liability with no passenger sub-limit. Coverage shall meet each of the following requirements:

- 16.7.1.1 By "Additional Insured" endorsement, add as insured PG&E, its directors, officers, parent company, agents and employees with respect to liability arising out of the Work performed by or for the Contractor;
- 16.7.1.2 Be endorsed to specify that the Contractor's insurance is primary and that any insurance or self-insurance maintained by PG&E shall not contribute with it;
- 16.7.1.3 Be endorsed to specify that defense costs are outside of policy limits; and



16.7.1.4 Waive all rights of subrogation against PG&E with respect to all physical damage to any aircraft used during the performance of this Contract.

16.8 HULL INSURANCE: Coverage shall be maintained for physical damage for the full value of the aircraft, and coverage shall waive all rights of subrogation against PG&E with respect to all physical damage to any aircraft used during the performance of this Contract.



SECTION 2 MATERIALS

1.0 MATERIALS HANDLING AND DISPOSAL

- 1.1 Section 2. Materials, of the Specific Conditions, describes the requirements pertaining to all Work related to materials condition, handling, storage and transportation. Section 1, Scope of Work, of this Specific Conditions governs all the Work pertaining to this Section 2.
- 1.2 Contractor shall provide, handle and dispose of all materials and supplies used in the performance of the Work.
 - 1.2.1 Contractor is responsible for procurement of all materials except as specified in Attachment F – *PG&E Provided Materials for Underground Cable and Overhead Electric Facility Installation*, Attachment G – *PG&E Provided Materials for Underground Conduit and Gas Facility Installation* or as otherwise specified in writing.

1.3 HAULING AND HANDLING OF MATERIAL FURNISHED BY PG&E

- 1.3.1 Contractor shall be responsible for pickup, transportation, off-loading and storing of PG&E provided material. Contractor shall take receipt of the material either at the PG&E facility or the material will be delivered to a Contractor's acquired yard. PG&E Representative shall notify Contractor when the material is available. Contractor shall take delivery within forty eight (48) hours of notification and transport all available material to the Contractor worksite
- 1.3.2 Upon receipt, Contractor shall inventory and check all PG&E furnished material items with PG&E Representative. Contractor shall report any discrepancies in material to PG&E Representative at the time of receipt. Discrepancies in material not reported at the time of inventory and receipt will not be a basis for extension of time or extra payment. Any PG&E provided material that may have been lost, stolen, damaged or unaccounted for would be replaced by PG&E at Contractor's expense.
- 1.3.3 Contractor shall transport PG&E materials to the worksite or other storage area and shall load, unload, store, transport and otherwise care for PG&E materials in the most suitable manner required to protect the items from loss or damage due to theft, mishandling or improper care. Contractor shall obtain all permits required by the federal, state and local authorities for transportation of PG&E materials to the worksite or other storage area and for storage of said materials.
 - 1.3.3.1 Materials shall be stored by Contractor in a secure storage area, either on or off the worksite in accordance with all rules and regulations of the local governmental agencies having jurisdiction.
 - 1.3.3.2 Contractor shall locate and arrange for its materials staging areas, construction operations areas and other areas, as it deems necessary and at its own expense.
 - 1.3.3.3 Contractor shall properly store all such materials, taking all necessary precautions to protect them from damage or loss.



- 1.3.3.4 Contractor shall furnish material clerks and watchmen where necessary to tally and record the delivery to Contractor of material and equipment furnished by PG&E.
- 1.3.3.5 Contractor shall store all PG&E materials in such a manner as to prevent damage or deterioration due to weather, including but not limited to rain, heat and cold.
- 1.3.3.6 Contractor shall clean up and restore all material stockpiling and handling areas to their original condition to the satisfaction of PG&E Representative. All excess materials furnished by PG&E shall be packaged, and prepared for return by the Contractor. All material and equipment shall be packaged in a way to reduce damage or potential hazard. The Contractor shall provide at least a five (5) day notification to the PG&E Contract Management Department Representative to arrange/schedule pick up of material and equipment. Contractor shall provide an inventory of all material and equipment being returned to PG&E. If a contractor vacates a yard and does not complete the Work and PG&E has to use its labor to complete the Work, the cost for PG&E to perform Work will be deducted from the final payment to contractor. PG&E also reserves the right to charge for any associated labor costs in the recovery of missing material and equipment.
- 1.3.4 All excess materials furnished by PG&E shall be returned to the PG&E yard. PG&E will deduct from Contractor's final contract payment an amount to reflect any unused materials that are not returned.
- 1.3.5 All empty non-returnable containers, non-returnable reels, cribbing and other packaging shall be considered scrap and shall be considered the property of the Contractor unless otherwise specified by the PG&E Representative. Contractor shall assume full responsibility for proper disposal of such items in accordance with all applicable state and/or federal law, regulations, orders or codes of the governmental agencies having jurisdiction thereof. Partially used products not limited to glues, paints, solvents or hazardous waste (e.g., empty containers, liquid fuses, etc.) are considered the property of the Contractor and shall be the Contractor's responsibility to manage and dispose of in accordance with all state and/or federal law, regulations, orders, or codes of the governmental agencies having jurisdiction thereof. PG&E will continue to provide a roll-off dumpster for the disposal of treated poles.

1.4 MATERIALS TO BE FURNISHED BY CONTRACTOR

- 1.4.1 Contractor shall be responsible for procurement of any material that is necessary to perform the Work and shall be responsible for its transportation, handling and storage, unless otherwise stated in writing. Unless otherwise specified, all materials supplied by Contractor that will become a permanent part of the completed Work shall be new.
- 1.4.2 PG&E requires that all material that is to be furnished by Contractor be procured from PG&E approved suppliers/vendors and shall be PG&E grade.
 - 1.4.2.1 Contractor shall procure Joint Party materials from suppliers/vendors approved by the respective Joint Parties.
- 1.4.3 Prior to use, material furnished by Contractor shall be inspected and approved by PG&E Representative. PG&E Representative will verify that all defective and/or



nonconforming materials are removed from the worksite and replaced with materials that meet PG&E Specifications.

- 1.4.4 Any material supplied by Contractor shall be included in the pricing.
- 1.4.5 Contractor, at its expense, shall furnish all temporary materials necessary to accomplish this Work.
- 1.4.6 For any material supplied by Contractor on a cost plus basis, the percentage fee as listed in the Contract shall be applied to Contractor's actual invoice cost for materials.
- 1.5 **PROPER DISPOSAL:** Any waste material, which PG&E Environmental Representative classifies as non-hazardous waste, shall become the property of the Contractor. Contractor shall dispose of all such waste properly and at Contractor's expense. Contractor shall not dump waste of any kind, whether hazardous or non-hazardous, into PG&E dumpsters or onto PG&E property including, but not limited to, disposal of batteries, aerosol cans, paint, oil containers, oil-soaked rags and methylisothiocyanate cartridges.
- 1.6 **HANDLING OF SALVAGE OR UNUSED MATERIALS PROVIDED BY PG&E**
 - 1.6.1 This Paragraph 1.6 applies to PG&E supplied material only.
 - 1.6.2 Unless otherwise directed by PG&E Representative, it shall be Contractor's responsibility to properly package, bundle or group items of PG&E Salvage Material by general like items and arrange/schedule pick up of material and equipment by PG&E prior to Contractor's final departure from the worksite at the completion and acceptance of the Work.
 - 1.6.2.1 All groups, bundles or packages of PG&E Salvage Material shall be organized to facilitate ease of loading, unloading and handling. Contractor shall be responsible for unloading and placement of all PG&E Salvage Material. Contractor shall place the material only in areas designated by PG&E Representative. Material placed in unauthorized or non-designated areas shall be moved to its proper location by Contractor at no charge to PG&E.
 - 1.6.2.2 Any salvage or unused material classified by PG&E Representative as "no value" junk shall become the property of Contractor and shall be disposed of properly and at Contractor's expense. Disposal shall be in accordance with requirements of governmental agencies having jurisdiction thereof.
 - 1.6.2.3 Contractor shall provide an itemized list of PG&E Salvage Material and unused material returned to PG&E.
- 1.7 **SPECIAL REQUIREMENTS FOR HANDLING CABLE:** Under no circumstances shall the cable be allowed to drop or roll free, nor shall it be otherwise handled in such a manner as might damage any part of the cable or cause distortion or deformation to the cable's cross section. No spool of cable shall be stockpiled higher than two tiers. Stockpiled cable shall be blocked to prevent movement or rolling. The responsibility for safety lies with Contractor.
 - 1.7.1 Contractor is cautioned to exercise particular care in unloading and handling cable, equipment and appurtenances. Any damage caused to the cable, poles, equipment or other materials while in Contractor's care shall be the



responsibility of Contractor and all expense required for replacement or repair shall be borne by Contractor at no cost to PG&E.

- 1.7.2 During the course of construction, Contractor may be required to remove existing cable to clear conduit for new cable installation. The removed cable shall be conserved as scrap cable. Contractor shall load the scrap cable onto a steel spool and transport it to a suitable location, where it shall be transferred from the steel spool to a wooden spool. Contractor shall perform this operation at no additional cost to PG&E.

- 1.8 **SPECIAL REQUIREMENTS FOR HANDLING CONDUIT:** At no point shall the conduit be allowed to drop or roll free, nor shall it be otherwise handled in such a manner as might damage any part of the conduit section or cause distortion or deformation to the ends of the conduit. No bundle of conduit shall be stockpiled higher than two tiers. Stockpiled conduit shall be blocked to prevent movement or rolling. All conduit shall be secured while being transported. The responsibility for safety lies with Contractor.

- 1.8.1 Contractor shall store conduit and fitting so as to prevent the possibility of the material being damaged by crushing, gouging or piercing.
- 1.8.2 Care must be taken by Contractor at all times to protect conduit and fittings from fire, sunlight, excessive heat, harmful chemicals or mechanical damage. Supplies or other equipment shall not be placed on conduit. Any conduit or fittings not accepted by PG&E due to damage, discoloration, age, or any other reason shall be replaced at Contractor's expense.
- 1.8.3 The stringing of coils of plastic conduit may be accomplished by hand or from a reel. Coils shall not be rolled over sharp objects or the pipe pulled over rough surfaces.
- 1.8.4 Coiled conduit is confined with straps at intervals within the coils. As the conduit is uncoiled, only the outside straps may be cut. Precautions should be taken to avoid kinking the conduit. The conduit shall not be uncoiled faster than the straps can be cut.
- 1.8.5 All PG&E supplied precast vaults, boxes, and lids shall be delivered to the worksite by a PG&E vendor or Materials Department. Contractor is responsible for notifying the PG&E Representative five (5) working days prior to the date boxes need to be delivered to the worksite. Contractor shall provide delivery site.

2.0 HAZARDOUS MATERIALS

2.1 GENERAL

- 2.1.1 Contractor must be aware of the possibilities of encountering hazardous materials (i.e., contaminated soils, chemical products) during the performance of the Work specified herein. Contractor shall also have a program that complies with all applicable laws, rules and regulations and shall provide program information and training to its employees and Subcontractors who are or may be exposed to materials containing hazardous substances in their work environment including Contractor-generated hazardous substances.
- 2.1.2 Contractor shall provide at PG&E's request copies of training records for those employees working on this project.

2.2 CONTRACTOR TRAINING AND NOTICE



- 2.2.1 Contractor shall ensure that its employees are aware of all state and federal standards, rules and regulations with respect to working around or near hazardous materials. In particular, Contractor shall ensure that Contractor's employees are aware of and protected from the hazards of working with hazardous materials including, but not limited to, the following: lead, PNAs (Polynuclear Aromatic Hydrocarbons – a byproduct of coal gasification, found in soil), tetrachloroethylene (from liquid fuses) pentachlorophenol (most common pole treatment), MITC-Fume® (methylisothiocyanate, highly toxic pole treatment applied to standing, in-service poles to extend their useful life) and polychlorinated biphenyl (PCB).
- 2.2.2 **CONTRACTOR EMPLOYEE TRAINING:** Contractor shall use only qualified and appropriately trained personnel who have been instructed in the proper safety procedures to be used while working with hazardous materials. Contractor and Contractor's employees shall have the necessary training to handle the hazardous materials including, but not limited to, first response handling of PCB oil spills and the handling, storage, labeling, packaging and shipping requirements for non-PCB oil spills and non-spill hazardous waste.
- 2.2.3 **HAZARDOUS MATERIAL TRAINING RECORDS:** Contractor shall maintain records of hazardous materials training provided to Contractor's employees. Such records shall be available for review and audit by PG&E. Training records shall include, but not be limited to the name of employee, date and location of training and name of trainer.
- 2.3 **MATERIAL SAFETY DATA SHEETS**
 - 2.3.1 Material Safety Data Sheets (MSDS) are to be maintained by Contractor at/near the worksite for all materials containing hazardous substances. Contractor shall comply with all federal, state and local laws as it applies to the keeping of hazardous substance records.
 - 2.3.2 The MSDS shall contain all required information in the categories listed: Material and Manufacturer Identification, Ingredients, Physical Data, Fire and Explosion Data, Health Hazard Data, Reactivity Data, Spill or Leak Procedures, Special Protective Information and Special Precautions.
 - 2.3.3 Upon Contractor's written request and subject to the availability of a material safety data sheet (MSDS), PG&E Representative will provide Contractor with a MSDS for any PG&E-supplied material that may be considered hazardous.
- 2.4 **ELECTRIC**
 - 2.4.1 **LINE EQUIPMENT OIL SPILLS**
 - 2.4.1.1 **GENERAL:** Contractor shall take immediate steps to safely contain any and all spills of oil and prevent the spread of contamination into traffic areas, waterways, drains and other areas that could cause the spill to spread. Contractor shall have an emergency spill kit readily available for this purpose. Contractor shall protect the public from any spill. Contractor shall notify PG&E Representative immediately following the completion of all appropriate emergency response procedures to contain the spill, but not later than one (1) hour from the occurrence of any spill to assure a timely and complete clean-up and inspection of the contaminated area in accordance with standard regulations and practices. PG&E is responsible for making any required notifications to government agencies.



- 2.4.1.2 HAZARDOUS MATERIAL SPILL CLEAN-UP COSTS: Contractor shall be responsible for all costs associated with the clean-up of any hazardous material spills caused by Contractor, regardless of whether the cleanup is performed by Contractor or PG&E.
- 2.4.1.2.1 If Contractor causes an oil spill of unknown PCB content, cleanup costs for which Contractor is responsible include, but are not limited to, the cost to conduct immediate oil sample tests at a PG&E-approved, accredited laboratory and transportation of those samples.
- 2.4.1.3 NON-PCB OIL AND OTHER HAZARDOUS MATERIAL SPILLS: When an oil spill occurs, Contractor shall examine the damaged line equipment for a sticker reading "Non PCB." If the line equipment is clearly marked by a "Non PCB" sticker, the spill is considered non-PCB and Contractor shall perform the clean-up.
- 2.4.1.3.1 Contractor shall clean-up all such non-PCB spills immediately and in accordance with all applicable laws, rules and regulations. Contractor's clean-up shall include, but not limited to, removing contaminated soil and vegetation until there are no visible traces of liquid and restoring property to its original condition.
- 2.4.1.4 PCB OIL SPILLS: If the equipment is not clearly marked by a "Non PCB" sticker, or where the PCB content cannot be determined by another legally acceptable means, the oil must be tested to determine if the oil contains PCB. Contractor shall notify PG&E Environmental Representative and PG&E will determine by laboratory testing if the unmarked equipment contains PCB or Non PCB oil.
- 2.4.1.4.1 PG&E will clean up the spill whether or not the laboratory test determines existence of PCB in the oil. Pursuant to Section 2, Paragraph 2.4.1.2, Contractor shall reimburse PG&E for all costs PG&E incurs as a result of the spill.
- 2.4.1.5 OIL LEAKS: Whether or not the leak was caused by Contractor, Contractor shall notify PG&E Environmental Representative immediately while completing all appropriate emergency response procedures and within one (1) hour of the discovery of oil leaking from any PG&E line apparatus (transformers, capacitors, etc.).
- 2.4.1.5.1 Contractor is responsible for containment of leaking equipment whether at the material staging area, the Work site or during transportation to or from the Work site. Such equipment shall be sealed as soon as possible and placed into approved PG&E containers for shipment. PG&E materials drivers will not transport unsealed oil-filled equipment. U.S. Department of Transportation (DOT) approved containers will be provided upon request by PG&E on an "as-needed" basis.
- 2.4.1.6 PAST CONTAMINATION: If Contractor discovers a past spill or evidence of contamination in the Work area, Contractor shall immediately notify the PG&E Representative, who will arrange for cleanup and agency notification if appropriate.

- 2.4.1.7 Contractor shall use care to prevent oil spills, including but not limited to ensuring that all transformers, capacitors and other oil-filled equipment are adequately tied down to Contractor's truck/trailer bed to prevent tipping or damage.

2.4.2 NON-SPILL HAZARDOUS WASTE

- 2.4.2.1 Any hazardous waste or equipment removed from the Work site by Contractor as part of the scope of Work shall be handled for disposal as designated by the PG&E Environmental Representative. All PCB equipment and material shall only be transported by PG&E. Other hazardous waste and equipment may be transported by either PG&E or by Contractor and delivered to a designated PG&E facility. If Contractor transports hazardous waste and material, it shall comply with all applicable laws and regulations, including but not limited to California Health and Safety Code Section 25163.3.
- 2.4.2.2 PG&E will dispose of all hazardous waste and prepare and sign the Uniform Hazardous Waste Manifest or Land Disposal Restriction (LDR) forms.
- 2.4.2.3 Contractor is responsible for packaging, labeling and proper storage of all hazardous materials and waste. Contractor shall handle all hazardous waste according to all state and federal standards, rules and regulations specific to that waste including, but not limited to, Department of Transportation (DOT) requirements for shipping and packaging.

2.5 ELECTRIC SUBSTRUCTURES

2.5.1 POTENTIAL WORKSITE HAZARDOUS MATERIALS

- 2.5.1.1 ASBESTOS: Contractor shall be deemed to have notice that, although the handling of asbestos is not involved in the Contract, asbestos and polynuclear aromatics (PNAs, a class of organic chemicals) may be in the vicinity of this worksite. Contractor must be experienced in identifying asbestos and must be careful to avoid disturbing those particular areas, should they exist. Contractor must inform its employees and Subcontractors of the above.
- 2.5.1.2 CONDUIT AND CABLE FIREPROOFING WRAP CONTAINING ASBESTOS AND PNA's:
 - 2.5.1.2.1 PG&E's pre-1972 fireproofing may contain asbestos and polynuclear aromatics (PNAs, a class of organic chemicals, some of which are carcinogenic). Proper procedures must be followed when asbestos and/or PNAs are present. The procedures set forth below only apply to pre-1972 installations.
 - 2.5.1.2.2 Employee Protection During Handling of Fireproofing Materials: The primary concern is to protect workers from airborne asbestos that may be generated when working with fireproofing material. Because the asbestos is so tightly bound, the only likely activities that could cause it to become airborne are certain mechanical methods of pipe



wrap removal. To reduce airborne exposure to asbestos, grinding, filing, burning or sawing shall not be used for removing fireproofing material. Careful chipping with a wetting agent (such as soapy water) on the fireproofing material is the recommended method of removal. The likely routes of exposure to PNAs are by ingestion and skin contact. To avoid this, Contractor's workers must practice good personal hygiene when working with fireproofing material. This includes wearing gloves when handling the fireproofing material and washing their hands before smoking or eating.

- 2.5.1.3 CONTAMINATED SOIL: If contaminated soil is encountered during excavating, trenching or boring, Contractor shall immediately stop Work and do the following:

- 2.5.1.3.1 Notify PG&E Representative;
- 2.5.1.3.2 Replace the contaminated soil in the trench;
- 2.5.1.3.3 Close the worksite; and
- 2.5.1.3.4 Take such steps as may be appropriate under the circumstances to protect the safety of the public and of Contractor's crew. Contractor shall not remove, handle, store or dispose of contaminated soil or waste material.

- 2.5.1.4 OTHER HAZARDOUS MATERIALS: In conjunction with the Construction General Conditions of this Specification, Contractor and its employees and Subcontractors are deemed to have notice that may be exposed to certain hazardous materials including, but not limited to, pipe primers, solvents, thinners and fuels.

3.0 YARD SIZE FOR DELIVERIES

- 3.1 PG&E has specific requirements for access and egress at Contractor's yard. The PG&E Warehouse Operations group utilizes forty-foot (40') and forty five-foot (45') trailers to transport jobsite material and equipment to Contractor's yard. Contractor's yard must have at a minimum a twenty feet (20') wide gate to accommodate trucks entering and exiting yard. Fence or gate should be set back from the street to allow the truck room to pull safely up to the gate out of traffic.
- 3.2 If PG&E trucks are required to park and offload outside the yard, Contractor shall provide enough area to operate a forklift safely while not impacting the driver's safety and the safety of others. PG&E's trailers are one hundred two inches (102") wide and a forklift requires approximately twelve feet (12') on each side to safely operate. More room may be required if delivering twenty-foot (20') to forty-foot (40') pipe. If the driver has to operate or offload material in the street, Contractor shall provide traffic control.
- 3.3 If the Contractor's yard can accommodate a truck and trailer, there should be an open area that will allow the truck to turn completely around, or a path through the yard that will enable the truck to come around and drive forward out of the Contractor's yard.
- 3.4 Contractor shall be responsible for providing a yard person to help with the unloading and staging of material and equipment. Contractor is responsible for providing a lay down area where material and equipment can be stored, stacked, and managed to minimize breakage or damage.



SECTION 3 OVERHEAD ELECTRIC FACILITIES CONSTRUCTION

1.0 GENERAL

- 1.1 Section 3, Overhead Electric Facilities Construction of the Specific Conditions, describes the requirements pertaining to all Work related to overhead electric facilities construction. Section 1 of this Specific Conditions governs all the Work pertaining to this Section 3.
- 1.2 **SCOPE OF WORK:** The Work to be performed by Contractor includes, but is not limited to, furnishing transporting to worksite and installation of all electric primary and secondary distribution cable including terminating, splicing, grounding, setting poles, transferring conductors and the complete installation of all underground and overhead equipment. All Work shall be performed in a manner that shall minimize the number and duration of service disruptions to PG&E customers. Work shall be performed under energized conditions unless otherwise approved by PG&E.

2.0 WORK TO BE PERFORMED BY CONTRACTOR

- 2.1 Performance of all Work by Contractor shall be in accordance with the Contract; shall comply with PG&E Design Standards including, but not limited to, PG&E's Electric Overhead and Underground Construction Manuals and Electric and Gas Service Requirements; and shall meet all pertinent requirements of General Order Nos. 95 (GO95) and 128 (GO128) of the California Public Utilities Commission. When connected to existing PG&E Facilities, all Contractor-installed facilities shall support a fully operational overhead and/or underground electric system.
 - 2.1.1 Contractor shall also consult with PG&E and manufacturers of poles, conductors, cables, pole mounted equipment and underground equipment to obtain the recommended methods of installation. PG&E Representative will resolve any conflict between the Contractor's Work plan, manufacturer's installation instructions and PG&E's prescribed procedures for installation.
 - 2.1.2 When responding to a PG&E Request for Proposal, Contractor's proposal shall be based on full knowledge of the nature and general location of the Work, the general and local conditions, particularly those affecting transportation, disposal, handling and storage facilities, availability of labor, water, power, roads, climatic conditions, physical conditions at the project area as a whole, topography and ground conditions, equipment and facilities needed preliminary to and during Work performance and all other matters which can in any way affect the Work or cost thereof. Contractor's failure to familiarize itself with all available information regarding any applicable or potential job condition will not relieve Contractor of the responsibility for properly estimating the difficulties and/or cost of successfully performing the Work.
- 2.2 Work may include, but not be limited to, the following:
 - 2.2.1 Mobilization and demobilization to an area or project, including initial and return travel as needed to specific jobsites.
 - 2.2.2 Handle and haul all cable, wire, equipment and appurtenances to the jobsite, either from contractor yard or PG&E facility. Return trips to PG&E facility may be required for receiving back order material or specialty programmed equipment.
 - 2.2.3 Furnish all materials as specified in CWA, not furnished by PG&E.



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- 2.2.4 Provide and install all equipment necessary to maintain proper public safety in accordance with all applicable governmental rules, regulations, ordinances and any other applicable requirements.
- 2.2.5 Provide complete application and drawings for special traffic permits as required at no additional cost to PG&E.
- 2.2.6 Install wood electric distribution poles and conductors. Work shall include, but not be limited to, the complete installation of cross arms, hardware, insulators, associated guys, anchors, transferring conductors, secondary risers, primary risers, messengers, grounds, installation and connection of pole mounted equipment including oil-filled electrical equipment (e.g., reclosers, regulators, switches, capacitors, transformers, etc.) and connecting to existing energized overhead conductors.
 - 2.2.6.1 All Work shall be performed (setting poles, transferring conductors, etc.) under energized conditions unless otherwise approved by PG&E.
- 2.2.7 Determine cut lengths of all cable prior to its delivery.
- 2.2.8 Perform the pulling of all primary/secondary distribution cable into existing underground conduits.
- 2.2.9 Perform all terminating, splicing and grounding of underground cable.
- 2.2.10 Install all primary and secondary cable tags, equipment identification numbers and equipment tags.
- 2.2.11 Install subsurface/pad-mount transformers, switches, associated ground wires, cable terminations, identification signs and grouting where required (around pad-mounted equipment) and perform voltage checks and phase rotation testing before and after all transformer Work to ensure proper voltage and phase rotation is supplied. Contractor shall verify voltage and phase rotation. Contractor shall inform PG&E Representative immediately after verification is successful and complete.
- 2.2.12 Connect Contractor-installed facilities to existing overhead or underground PG&E Facilities to energize the system.
- 2.2.13 Contractor shall only perform specific individual switching operations on electrical lines and equipment under energized conditions within the Work area with prior permission of the PG&E Representative. Switching operations may include, but are not limited to, opening and closing jumpers, line cutouts, switches, fuses, disconnects, reclosers and similar devices; checking voltage, rotation, phasing and equipment status; and "standing by" while other switchmen perform operations. Contractor shall not be permitted to perform any switching operations inside PG&E substations.
- 2.2.14 Perform final testing of the completed cable system, including performance of phasing, rotation, voltage, electrical continuity, capacitance, conductor or guy tension, screw-anchor torque and miscellaneous other tests as required by PG&E Design Standards, Job Packages and/or PG&E Representative.
- 2.2.15 Provide all required tools and equipment to perform the Work.
- 2.2.16 Clean and leave the worksite in a presentable condition at the end of each workday, to the satisfaction of PG&E and agencies having jurisdiction thereof.



- 2.2.17 Restore concrete sidewalk surfaces removed or damaged during construction, including the furnishing of all materials required, to the satisfaction of the governmental agency or other parties having jurisdiction thereof.
- 2.2.18 Dispose of all non-hazardous waste material. Disposal costs shall be borne by Contractor.
- 2.2.19 Disposal of all hazardous material shall be performed in accordance with Section 1, Paragraph 13, and Section 2, Paragraph 2.0 of the Specific Conditions as well as the Contract.
- 2.2.20 After completion of all Work, restore the worksite to a condition at least equal to or better than that what existed prior to construction and meet the requirements of the jurisdictional or governing agencies issuing permits for said Work
- 2.2.21 Obtain permitting agencies' sign off on all Work as a condition of acceptance by PG&E.
- 2.2.22 Perform spiking of underground cable as necessary to prove de-energized under direction of PG&E Representative.

3.0 WORK TO BE PERFORMED BY PG&E

PG&E will perform the following Work unless otherwise stated in writing:

- 3.1 Review and approve any changes to the proposed design and/or configuration prior to Contractor's implementation.
- 3.2 Arrange for and coordinate all electrical switching and electrical clearances to energize or de-energize facilities.
- 3.3 PG&E will oversee the energizing of all Contractor-installed underground cables and equipment.
- 3.4 PG&E will oversee the Contractor's test procedures to ensure that all underground cables and equipment are energized or de-energized as each case warrants.
- 3.5 Provide inspection of contractors work and perform post construction quality audits.

4.0 CONTRACTOR EMPLOYEES QUALIFICATIONS

Contractor shall use only employees and Subcontractors who are technically competent and tested for the type and method of specific Work and licensed as appropriate. Contractor's employees and Subcontractors shall be directly employed and supervised by the Contractor, who shall be available to PG&E Representative at all times during the performance of Work. Contractor's employees and Subcontractors shall receive on-site training regarding PG&E's safety procedures and site rules prior to commencing any Work hereunder.

5.0 OVERHEAD ELECTRIC CONSTRUCTION

The Contractor shall perform all overhead electric work in accordance with, but is not limited to, all federal, state, local rules and regulations, PG&E Electric Overhead Construction Manual, Electric and Gas Service Requirements and CWA. PG&E Design Standards provide information as to materials and construction methods used throughout PG&E system and comply with utility industry standards. Any deviations from PG&E construction standards must be pre-approved by PG&E's designated representative.



5.1 UNLOADING OF POLES

To prevent damage, poles shall be unloaded from trucks, trailers and dollies by Contractor using one of the following methods as circumstances and traffic conditions permit:

- 5.1.1 By means of a line truck derrick, mobile-type crane or other pole handling equipment.
- 5.1.2 When conditions necessitate, poles may be lowered using skids and lines to control the descent.
- 5.1.3 Poles shall not be dropped over the side of a truck, trailer or dolly.

5.2 POLE SETTING

Pole setting depths will vary between locations contingent upon the size of pole, type of equipment being supported, span lengths, soil condition, contour and elevation. Unless otherwise noted in the Job Package for the specific pole location provided in CWA, Contractor shall strictly adhere to the minimum pole setting depths specified in PG&E's Electric Overhead Construction Manual Document 015203, Table 5.

- 5.2.1 Holes shall be dug as small in diameter as practical. However, at no time shall a pole butt be compromised to accommodate the diameter of the hole.
- 5.2.2 On sloping ground, the depth of the pole hole shall always be measured from the low side of the pole.
- 5.2.3 Enough space must be left around the butt of the pole to permit use of a tamping bar throughout the full depth of the hole. Prior to setting the pole, bottom of the hole shall be tamped to prevent settling.
- 5.2.4 It is important that all earth replaced in the hole be well tamped. Soil shall be banked around the pole to a minimum height of 6" to allow for settling. As little sod as possible shall be disturbed.
- 5.2.5 For poles being set in solid rock, pole backfill shall include one foot of $\frac{3}{4}$ " Class 2 aggregate around the bottom of the pole and a one foot collar of $\frac{3}{4}$ " Class 2 aggregate one foot from the top of the pole hole. All backfill material shall be thoroughly tamped for the full depth of the hole and the excess fill shall be mounded around the pole to a grade at least equal to but not more than 10% slope above the original grade.
- 5.2.6 The surface area surrounding a pole set or removal shall be left in the condition specified by PG&E's Representative.
- 5.2.7 Poles shall be set in alignment and plumb except at corners, angles, junctions or other points of strain, where they shall be set and raked against the strain. Acceptable visual limitations, as determined by PG&E's Representative, shall be the controlling factor in establishing correct pole installations within the following tolerances.
 - 5.2.7.1 Pole tops shall not be horizontally displaced from their position unless rake is required due to conductor tension, guying, line angle, heavy pole-bolted equipment or any combination thereof.
 - 5.2.7.2 Poles requiring rake shall be set to allow for not less than 2" for each ten feet of pole length above grade, and not more than 3" for each ten



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feet of pole length above grade, opposite the strain after conductors are installed at the required tension. Under no circumstances shall any pole have negative rake.

5.2.8 When a Joint Pole (a pole owned by PG&E and whose space on the pole is shared by another utility or utilities) is to be replaced, the new pole will be framed and set in the exact location indicated by the Job Package and the Joint Pole Agreement (JPA) provided in the CWA or long form contract. Any deviations from this must be pre-approved by a representative from both PG&E and the corresponding other utility.

5.2.8.1 If the new pole will be "set in same hole", the existing pole is removed and a new pole is installed in the hole vacated by the old pole. The Contractor shall arrange for the other joint utility or utilities, if applicable, to be at the job site in order to assist the Contractor in placing the new pole. Telecommunications' cables and/or facilities may be transferred by Contractor only if expressly instructed to do so by the Job Packages and/or the JPA provided in CWA.

5.2.8.2 If the new pole will be set adjacent to the existing pole, the old pole will be shortened to 1 foot above the telephone cable. The remainder of the old pole will be abandoned by PG&E but left in place for the benefit of other joint pole users.

5.3 FRAMING NEW POLES

5.3.1 Contractor shall install cross arms, brackets, braces, steps and all other associated hardware on poles as shown in the Job Package and in accordance with the applicable and most up-to-date PG&E Electric Overhead Construction Manual.

5.3.2 New poles may be framed, wholly or in part, prior to setting or may be framed after setting at the option of the Contractor. At no time, however, shall the pole or any attachment be subjected to a stress in excess of that for which it was designed.

5.3.3 Poles shall be framed in accordance with the Job Package and PG&E Electric Overhead Construction Manual Documents.

5.3.4 Should it become necessary to notch any pole to accommodate the installation of pole line hardware, it shall be notched, chiseled, cut or otherwise modified in such a manner that will least affect the strength of that pole.

5.3.5 Holes drilled in all poles for the installation of pole line hardware shall be drilled accurately using the smallest bit possible that will allow the bolt to pass.

5.3.6 Unless otherwise noted in the applicable construction standards, bolts attaching pole line hardware should not protrude beyond the nut by more than 1". If necessary, cut bolts and touch up with zinc primer No. 56 or equal.

5.3.7 All insulators and pole line hardware shall be carefully handled while being transported, assembled and placed. Insulators shall be kept in shipping packages as long as possible and thoroughly cleansed of all foreign materials immediately prior to installation.

5.3.8 Apply torque to all bolts and hardware as specified by the hardware manufacturer's specifications. If specifications were not provided by the



manufacturer, torque shall be applied to bolts and hardware to the satisfaction of PG&E's Representative.

- 5.3.9 Contractor shall install bonding as shown in accordance with PG&E Document 06667 of the Electric Overhead Construction Manual and as noted on the Job Package.

5.4 MAINTENANCE OF EXISTING POLES

5.4.1 POLE STRAIGHTENING:

- 5.4.1.1 An excavation of 4' minimum depth shall be made alongside of all poles prior to straightening. This excavation shall be made along the side of the pole opposite the direction in which it is leaning. Care shall be taken not to contact the pole with any auger or digging tools or equipment.
- 5.4.1.2 Adequate support for the pole shall be provided during digging and straightening. Extreme care shall be taken to avoid placing undue stress or rapid movements on energized conductors or their supporting structures, taking into consideration the condition of the conductors (uneven sag, damaged or annealed conductors, etc.) and supporting structures (insulators, wood pins, crossarms, etc.). Non-tests shall be considered for poles supporting energized primary conductor based on given situation and requested through PG&E representative following required timelines and approval process.
- 5.4.1.3 Pole backfill shall be thoroughly tamped in all voids left by digging and pole movement due to straightening and shall be subject to the approval of PG&E's Representative.

- 5.5 **EXISTING GO95 AND GO128 INFRACTIONS:** When work is to be performed on existing poles, Contractor shall eliminate any existing California Public Utilities Commission General Order Nos. 95 (GO95) and 128 (GO128) infractions from ground level up to and including the circuit level at which such Work is performed, whether or not such infractions are caused by Contractor's Work. Common infractions might include, but are not limited to, exposed ground wires, missing or improper visibility strips and high voltage signs, missing guy guards, pole steps improperly placed, climbing space encroachments, down guys grounded by tree limbs above the insulator and insufficient hardware clearance. This Work will be subject to the same PG&E inspection and approval governing any other portion of the work and is required beyond what may be stated on the Job Package for that pole.

- 5.5.1 **EXCEPTION:** Contractor will not be required to correct infractions on existing poles where the Work to be performed by Contractor only involves a switching step unless such infractions constitutes a hazard to life or property or unless such infractions directly or indirectly results from Contractor's Work.

5.6 INSTALLATION OF ANCHORS AND GUYS

- 5.6.1 Anchors and anchor rods shall be installed by Contractor in accordance with the Job Packages, in accordance with PG&E Documents 06537, 022178 and 022221 of the Electric Overhead Construction Manual and location stakes placed in the field by PG&E personnel (if provided). Anchor leads shall not be changed from what is stipulated in the Job Packages without prior approval of PG&E representative.



- 5.6.2 The installation of pole line guys shall be in accordance with the Job Package provided in CWA and the applicable PG&E Electric Overhead Manual Construction Documents.
- 5.7 **INSTALLING OVERHEAD CONDUCTORS:** Contractor shall install new overhead electric conductors including jumpers, ties, armor rod, connectors, dampers and attachments as shown on the Job Package and in accordance with PG&E Documents 015195, 059626, 052990, 028853, 022487, 041010, 066194, 015073, 028851 and 028852 of the Electric Overhead Construction Manual.
- 5.7.1 Contractor shall install new conductor from one dead-end structure to another dead end structure. Splices on new conductor installations are not allowed.
- 5.7.2 Contractor shall ensure that reel handling equipment has ample capacity, operates smoothly and is leveled and aligned prior to stringing.
- 5.7.3 Contractor shall protect all crossings, including, but not limited to, street, highway and railroad crossings, canals and other power and communication lines, during the installation of the new conductors. Contractor shall use hold-down devices when crossing below energized circuits in spans and tensioning equipment or guard structures when stringing lines above energized circuits. Contractor shall secure conductors adjacent to energized crossings with a safety device capable of upholding conductor weight in event of cable or tool failure.
- 5.7.4 Stringing in new conductor in the energized mode is preferred; however in those cases when using an existing conductor as a pulling line, Contractor shall carefully examine the old conductor and splices for any damage that might reduce its strength. Contractor shall not exceed the Working Load Limit of existing conductor being used to pull new lines.
- 5.7.5 Contractor shall string new conductor through rollers. Contractor shall ensure that all sheaves are sized appropriately for the conductor being installed, are free rolling and are without defects.
- 5.7.6 While stringing, Contractor shall keep the conductor under sufficient tension to prevent contact with the ground, fences, guard poles, wires or structures. Contractor shall ensure that conductors do not become kinked, twisted, flattened or abraded in any manner.
- 5.7.7 Contractor shall perform clipping of conductors in a timely manner or as directed by PG&E Representative on the project.
- 5.7.8 Contractor shall ensure that clamp bolts and all other hardware bolts are tightened in accordance with manufacturers torque specifications.
- 5.7.9 Contractor shall form and install jumpers of proper length and shape to maintain electrical clearances and prevent uplift.
- 5.7.10 Contractor shall install dampers with bolt heads turned toward the structure. After attaching and tightening bolts, the damper must hang parallel/ below the conductor unless otherwise specified.
- 5.7.11 Contractor shall replace all bolted connectors with fired wedge connectors. Fired wedge connectors are the PG&E preferred connector and shall be used exclusively. Compression type connectors may be used only if the applicable fired wedge connector is not available.



- 5.7.12 Contractor shall install secondary aerial cables in accordance with PG&E Documents 057875 and 057876 of the Electric Overhead Construction Manual.
- 5.8 REPAIRING and SPLICING OVERHEAD CONDUCTOR:
- 5.8.1 Contractor shall make any necessary repairs to overhead electric conductors in accordance with PG&E Document 028855 of the Electric Overhead Construction Manual.
- 5.8.2 For those cases where conductor splicing is required, such as pole relocations and pole replacements with increased pole heights and additional conductor is needed to maintain proper sag, splices used shall be in compliance with bulletin TD-022487B-001 Application of Compression and Automatic Splices for Distribution Conductors.
- 5.8.3 Prior to installing splice, wire shall be prepped in accordance with PG&E OH construction standard drawing 022487 and its associated bulletins.
- 5.9 SAGGING OVERHEAD CONDUCTOR: Contractor shall sag overhead electric conductors and secondary aerial cables as shown on the Construction Drawings and in accordance with PG&E Documents 015221 and 057877 of the Electric Overhead Construction Manual. Contractor shall not perform sagging operations when, in the opinion of PG&E, wind, low temperatures, fog or other adverse conditions prohibit accurate measurements.
- 5.9.1 Contractor shall check sags utilizing a Sighting Method. Contractor may only use other methods of sagging, such as a dynamometer or stopwatch / return wave, to check the results obtained by sighting.
- 5.9.2 Contractor shall check sags in a span with the closest length to that of the ruling span. Where only one span is used for checking the sag, Contractor shall ensure that it is in the approximate middle of the sag section. Where two or more spans are used for checking the sag, Contractor shall ensure that they are located approximately equidistant from each other and from each end of the sag section.
- 5.9.3 Contractor shall check sags in at least one span in each sag section less than five (<5) spans, in 2 spans in each sag section of five to eight spans and in 3 spans in each sag section of nine or more (9+) spans.
- 5.10 INSTALLING OVERHEAD ELECTRIC DEVICES: Contractor shall install transformers, switches, cutouts, capacitors, fuses, reclosers, regulators and other electric devices on poles as shown on the Job Packages.
- 5.10.1 Contractor shall install overhead distribution transformers in accordance with PG&E Document 056425 of the Electric Overhead Construction Manual.
- 5.10.2 Contractor shall install overhead switches in accordance with PG&E Document 066195 of the Electric Overhead Construction Manual.
- 5.10.3 Contractor shall install overhead distribution capacitors in accordance with PG&E Document 066200 of the Electric Overhead Construction Manual.
- 5.10.4 Contractor shall install overhead distribution cutouts, fuses and disconnects in accordance with PG&E Document 022318 of the Electric Overhead Construction Manual.



- 5.10.5 Contractor shall install overhead distribution line reclosers in accordance with PG&E Document 066199 of the Electric Overhead Construction Manual.
- 5.10.6 Contractor shall install overhead distribution line regulators in accordance with PG&E Documents 015237 and 015238 of the Electric Overhead Construction Manual.
- 5.11 **INSTALLING STREET LIGHTING:** Contractor shall install street lighting luminaries, conductors and brackets as shown on the Job Package and in accordance with PG&E Document 015132 of the Electric Overhead Construction Manual.
- 5.12 **OVERHEAD ELECTRIC SERVICE CONNECTIONS:** Contractor shall install service connections as shown on the Job Package and in accordance with PG&E Documents 022169, 023732, 025202, 027911, 029598 and 036379 of the Electric Overhead Construction Manual.
 - 5.12.1 Contractor shall replace all gray services. For the newer black services which are in good condition and are a minimum of #2 wire, and unless otherwise specified in the Job Package these services can be transferred and, if needed, spliced if they are too short to reach the position on the pole.
- 5.13 **GROUNDING OVERHEAD WIRES AND DEVICES:** Contractor shall ground overhead wires and devices as shown on the Job Packages and in accordance with PG&E Documents 015003, 021904 and 056425 of the Electric Overhead Construction Manual.
- 5.14 **RISER MOLDING:** Contractor shall install all necessary cable molding in a parallel configuration outside of the pole's climbing space in accordance with drawings and instructions contained in PG&E Electric Overhead Construction Document 021924.
- 5.15 **MARKING**
 - 5.15.1 All poles or cross arms carrying primary voltages shall have approved High Voltage signs installed in accordance with the PG&E Electric Overhead Construction Manual.
 - 5.15.2 Certain poles or cross arms carrying primary neutral conductors shall have approved Primary Neutral (PN) signs installed in accordance with PG&E Electric Overhead Construction Manual Document 022168.
 - 5.15.3 New streetlight numbers shall be installed upon installation or transfer of PG&E streetlights in accordance with the PG&E Electric Overhead Construction Manual.
 - 5.15.4 New approved riser tags shall be installed upon installation or transfer of electric risers, in accordance with the applicable PG&E Electric Underground Construction Document (033582). Care shall be taken to preserve and transfer the information contained on existing riser tags before such tags are removed, damaged or destroyed. Riser tags shall only be punched plastic tags and contain the information noted on drawing 033582, note 5c for primary and 7b for secondary and services.
 - 5.15.5 New equipment numbers shall be installed upon installation or transfer of switches, capacitors, reclosers, regulators, boosters, sectionalizers or line cutouts (fused or solid blade), in accordance with the PG&E Electric

Overhead Construction Manual. At the discretion of PG&E's Representative, Contractor shall carefully remove and transfer existing signs in good condition.

- 5.15.6 Poles and downguys accessible to traffic shall have approved visibility strips and guy markers installed in accordance with the PG&E Electric Overhead Construction Manual. This requirement includes locations where Contractor performs Work on existing poles and such poles have substandard or missing visibility strips or guy markers.
- 5.15.7 All poles set by Contractor shall have a "date nail" bearing the current year's number (e.g. "96") installed at a height of five and one-half feet (5.5') above ground level, in accordance with the PG&E Electric Overhead Construction Manual.
- 5.15.8 Cost for compliance with this section will be included in the Contractor's pricing.

5.16 INSULATOR AND HARDWARE

- 5.16.1 All of the provisions of this Paragraph 5.6 shall apply to all new insulators and any insulators being re-used on all Work covered by the Contract.
- 5.16.2 Contractor shall inspect the insulators at the time of receipt from PG&E. Contractor shall replace or pay for all insulators that are damaged after receipt from PG&E.
- 5.16.3 Contractor shall inspect the insulators prior to being installed. Contractor shall notify PG&E's Representative concerning any damage to the new insulators. Contractor shall install only undamaged insulators.
- 5.16.4 No chipped or broken insulators shall be used. All insulators shall be carefully handled while being transported, assembled and installed. Insulators shall be kept in their shipping package as long as possible and thoroughly wiped with clean rags to remove grass, twigs, dirt and other foreign matter immediately prior to installation. Wire brushes shall not be used for cleaning any of the parts. Insulator surfaces of ceramic and glass insulators shall be wiped to a bright finish. Metal surfaces shall be free from noticeable contamination.
- 5.16.5 Insulators shall be protected from the ground during hanging operations. Ceramic and glass insulators shall be handled with care to prevent chipping or cracking the insulation and to avoid excessive bending strain on the pin shanks or caps.
- 5.16.6 Non-ceramic insulators shall be handled with care to prevent tearing, ripping or other damage to the sheds and sheaths and to avoid excessive bending strain on the rods or end fittings.
- 5.16.7 Dampers shall be installed where indicated on the drawings provided in CWA. Non spiral style dampers shall be installed with bolt heads turned toward the structure. After attachment and tightening of bolts, the damper shall hang parallel/horizontal below the conductor unless otherwise specified.
- 5.16.8 Apply torque to clamp bolts and all other hardware bolts in accordance with manufacturer's specifications.

5.17 GROUNDING

- 5.17.1 Contractor is responsible for all necessary grounding to ensure safety or protection of facilities from potential hazards and shall ground in accordance with applicable safety laws and in accordance with acceptable electrical industry standards.
 - 5.17.1.1 Specifically, Contractor shall ground in compliance with Title 8, Division 1, Chapter 4, Subchapter 5, Group 2, Article 36, and Section 2941, (h) of the California Code of Regulations.
- 5.17.2 Unless approved by PG&E representative and control center, Contractor shall remove all such grounding devices at the end of each work day to prepare the line for service should PG&E operating needs require. Prior to notifying PG&E's Representative that any line or facility is ready to be returned to service, Contractor shall verify that all of its temporary grounding devices have been removed. Failure to remove such grounds can result in property/facility damage and/or bodily injury, unplanned service interruption, reduced future service reliability, customer economic hardship and PG&E revenue loss. Contractor shall be liable for any such damage or injury.
- 5.17.3 These provisions shall not prevent the Contractor from furnishing and installing as many additional grounds as it deems necessary for the protection of its own personnel against static and accidental contacts with energized circuits.
- 5.17.4 If a conductor or apparatus is not grounded, it must be considered as energized and so treated.
- 5.17.5 PG&E's Representative has the authority to issue orders concerning the termination of clearances and the removal of grounds wherever conditions so warrant.

5.18 WORK IN PROXIMITY OF EXISTING ENERGIZED POWER LINES

- 5.18.1 Contractor's operations will be conducted in proximity of existing energized power lines. The Contractor shall observe all pertinent Safety Regulations, including the requirements of Title 8, State Building Standards Article 36, section 2941, "Work on or in Proximity to Overhead High Voltage Lines."
- 5.18.2 **NON-PG&E UTILITIES:** Contractor is responsible for all activities and safety clearances necessary to de-energize, cross or ground non-PG&E power lines. Contractor is also responsible for notifying owners of telecommunication facilities or electric facilities owned by parties other than PG&E that might be interfered with or contact Contractor's general Work area. Contractor is responsible for all complaints or claims arising from such activities, clearances or contacts.
- 5.18.3 Contractor is responsible for the protection of all underground facilities in the Work area. When working on conductors adjacent to energized crossings, Contractor shall secure conductor with a safety device capable of upholding conductor weight in event of cable or tool failure.

5.19 CLEARANCES FOR ELECTRIC OVERHEAD DISTRIBUTION WORK

- 5.19.1 Contractor shall make every effort to perform Work safely and minimize the duration and frequency of clearances (planned electrical outages). Minimizing the duration and frequency of clearances is necessary to maintain PG&E electric service reliability and customer satisfaction. When clearances are



necessary, PG&E Representative will obtain, regulate and terminate all clearances and non-tests on PG&E's facilities, as requested by the Contractor. Under normal conditions, the Contractor shall give as much advance notice as possible; however, a minimum lead time of twenty one (21) days notification is required by PG&E Representative when planning to perform Work that may affect PG&E's electric system and shall be submitted through the Contractor Work Checklist, Attachment E.

- 5.19.2 Performance of work in the energized mode (no customers are shut down) is required. To further clarify, when we say no customers are shut down, this is for primary outages. Customers de-energized for transformer or secondary outages are acceptable, while still keeping the primary energized. For work where clearances are required for safety or other issues, the Contractor shall minimize the number of customers affected through the installation of line openers, temporary disconnects and opening jumpers both of primary and secondary. To establish clearance points and in addition to the utilization of the aforementioned items, the Contractor may also be required to perform simple switching operations such as opening/closing cutouts and switches. For work where the Contractor deems a clearance is required, advance approval shall be obtained from the PG&E Contract and Construction Management department prior to notification of customers.

6.0 VEGETATION CLEARANCE FROM ENERGIZED CONDUCTOR

In order to ensure compliance at the time of work completion, there should not be any vegetation within 10 feet of high voltage power lines, over 600 volts. Should the situation arise that requires tree removal or significant tree or vegetation trimming, Contractor must notify the Work Supervisor to further evaluate and find a solution to the situation. As part of the rolling schedule, pre-work site inspection should identify these or any other unusual situations that will require review by the Work Supervisor and notification to the Work Supervisor should be timely enough to allow for an equitable disposition.



SECTION 4 UNDERGROUND ELECTRIC FACILITIES CONSTRUCTION

1.0 GENERAL

- 1.1 This Section 4, Underground Facilities Construction of the Specific Conditions, describes the requirements pertaining to all Work related to underground electric facilities construction. Section 1 of this Specific Conditions governs all the Work pertaining to Section 4.
- 1.2 Section 3, Paragraphs 2 to 4 of the Specific Conditions applies to the Work described in this Section 4.
- 1.3 **SCOPE OF WORK:** The Work to be performed by Contractor includes, but is not limited to, furnishing transporting to worksite and installation of all electric primary and secondary distribution cable including terminating, splicing, grounding, transferring conductors and the complete installation of all underground equipment. All Work shall be performed in a manner that shall minimize the number and duration of service disruptions to PG&E customers. Work shall be performed under energized conditions unless otherwise directed by PG&E.

2.0 UNDERGROUND ELECTRIC CONSTRUCTION

2.1 GENERAL

- 2.1.1 Contractor shall perform all Work necessary to pull, splice and terminate underground cables; install, remove or replace underground electrical equipment, in accordance with PG&E's Electric Underground Construction Manual, Electric and Gas Requirements and the Contract. PG&E Design Standards provide information as to materials and construction methods used throughout PG&E system and comply with utility industry standards.
- 2.1.2 Contractor shall determine what tools, equipment and materials will be necessary for the successful execution of the Work and shall fully familiarize itself with the correct usage.
- 2.1.3 All Contractor's workmanship and installations shall comply with PG&E Design Standards in every respect and shall meet all pertinent requirements of General Order No. 128 of the California Public Utilities Commission.
- 2.1.4 Contractor shall perform phasing on all completed installations when required to ensure correctness of circuitry.

- 2.2 **PERFORMANCE OF WORK:** Contractor's work under this Contract may require performing work over, under or adjacent to PG&E's existing electric and gas facilities and other underground facilities. Contractor shall exercise caution to avoid damage to or disturbance of these facilities and shall be held liable for any damages, whether direct, indirect or consequential, resulting from Contractor's operation, in accordance with the terms of the Contract. Should damage occur, Contractor shall immediately notify both the owner of the facility and PG&E of the damage done to the facility and shall arrange for repair of the damage. Contractor shall make every effort to minimize consequential damage resulting from the construction specified herein.

- 2.2.1 If it becomes necessary for PG&E to relocate its existing underground Facilities in order for the Contractor to pull, splice and terminate cable, PG&E will not compensate Contractor for any related delays, mobilizations, demobilizations or any other Contractor incurred costs resulting from the Work.



2.3 PULLING CABLE

- 2.3.1 All cable pulling shall be done in accordance with TD-038193B-0000 PG&E Design Requirements for Underground Primary Cable and TD-9001M PG&E Electric Design Manual.
- 2.3.2 Contractor shall give PG&E's Representative written notification at least five (5) working days prior to start of pulling. NOTE: Contractor shall notify PG&E Representative 72 hours in advance of any Work to be performed in or around energized vaults, equipment, conductors or cables when said Work will require placement of protective coverings or devices.
- 2.3.3 CABLE CUT TO LENGTH: Unless otherwise instructed, Contractor shall pull precut (cut-to-length) cable only.
 - 2.3.3.1 Contractor shall pre-measure all cable runs and submit an associated list to PG&E's Representative at least three (3) weeks prior to taking receipt of the cable. Contractor shall calculate the length of all cable necessary to reach from enclosure to enclosure including additional cable necessary to rack, train, splice and provide adequate slack at each enclosure. PG&E will prepare and supply precut spooled cable to Contractor prior to its installation. Contractor shall compensate PG&E for all cable cut and not used on this project.
 - 2.3.3.2 Adequate cable end lengths shall be provided and properly placed in manholes to avoid longitudinal strains and distorting pressures on the cable at duct end bells.
 - 2.3.3.3 All cable shall be carefully checked as to length before being pulled into ducts. Cable cut too short to rack, train and splice as specified herein shall be removed and replaced by and at the expense of the Contractor.
- 2.3.4 Cable reels shall be stored and handled in a manner, which will prevent physical damage to the cable. Cable reels shall be stored on a hard surface to prevent contact between cable insulation and earth due to sinking of the reel. Impact damage between reels shall be prevented by aligning reels flange to flange or by using guards across flanges. During storage, the ends of all cable shall be kept water tight and protected with end caps.
- 2.3.5 All cable must be installed defect free. The equipment and methods used for pulling the cable shall be such that the cable, including its outer jacket, concentric and insulator, shall not be damaged and shall be subject to the approval of PG&E's Representative. Any procedure used during the pulling operation that will scratch, groove, kink, mar, twist or otherwise damage the cable will not be permitted. The cable shall be kept clean and shall not be permitted to contact any object that might cause damage to it. If the cable is damaged, the Contractor shall repair or replace the damaged sections in a manner satisfactory to PG&E's Representative and at no additional cost to PG&E.
 - 2.3.5.1 CABLE DAMAGE OR DEFECTS: In the event that damage or defects are discovered while removing the cable from the reel or damage should occur to the cable jacket, shield or insulation during cable installation, cable installation shall be halted and PG&E shall be notified of the damage. Cable installation shall proceed only after repair or replacement of cable to the satisfaction of PG&E's



Representative. All costs associated with the damage to cable by Contractor shall be borne by the Contractor.

- 2.3.6 The outside of each cable reel shall be carefully inspected and protruding nails, fastenings or other objects, which might damage the cable, shall be removed. A thorough visual inspection for flaws, breaks or abrasions in the cable sheath shall be made as the cable leaves the reel and the pulling speed shall be slow enough to permit this inspection. Damage to the sheath or finish of the cable shall be sufficient cause for rejecting the cable. Cable damaged in any way during installation shall be replaced by and at the expense of the Contractor.
- 2.3.7 CABLE SUPPORTS: Contractor shall install all support blocks, rack pins, cable lashings and block locks, as required to provide proper cable support in accordance with Electric Underground Construction Manual Standard No. 028077.
- 2.3.8 Before and after pulling, the leading end seal of each length of cable shall be examined and repaired if necessary. All cut cable ends shall be promptly sealed after cutting except those to be spliced or terminated immediately.
 - 2.3.8.1 The ends of all cables shall be sealed with heat shrinkable caps. Cap sizes shall be as recommended by the cap manufacturer for the cable OD and insulation. Caps shall contain sufficient adhesive that shrinkage of the cap during application results in formation of a positive watertight seal capable of withstanding complete immersion or total exposure without permitting the entrance of moisture.
 - 2.3.8.2 Each cable shall be kept sealed except when termination and splicing work is being performed.
- 2.3.9 CABLE PLACEMENT: Routing of all cable shall be as indicated on the drawings and any changes to the routing from the drawings must be approved by the PG&E Representative.
- 2.4 INSTALLATION: Cable installation shall be in accordance with PG&E Design Standards and the following:
 - 2.4.1 Prior to cable pulling, the duct bank and manholes shall be blown with air to prevent hazardous gas in the duct bank and manhole system.
 - 2.4.2 Pulling lines shall be free of all projections, which could snag or damage the insulation on the cables.
 - 2.4.3 Pulling equipment shall pull at a constant speed and shall start and stop at a slow, uniform rate.
 - 2.4.4 A calibrated instrument with a maximum tension drag hand shall be used to continuously indicate pulling tension.
 - 2.4.5 Cable reels shall be supported on trailers. Cable reel stands shall be braced to prevent their movement during cable pulling and shall be provided with reel brakes.
 - 2.4.6 A system providing reliable voice communication between those personnel at the reel and those at the pulling equipment shall be provided.



- 2.4.7 CABLE PULLING: Fishing and pulling shall be done with flexible round non-metallic tape, CO₂ propelled polyethylene cord, nylon rope or manila rope.
- 2.4.8 CABLE GRIPS: Cable grip pulling assemblies shall only be used on pulls calculated at less than 2,000 pounds. Only assemblies manufactured and approved by the cable supplier shall be used. All sharp points and edges on the hardware attaching the pulling rope to the cable shall be taped to prevent snagging or damaging the raceway.
- 2.4.8.1 The area of the cable covered by the grip or seal plus 6" shall be cut off and discarded when the pull is completed.
- 2.4.8.2 As soon as the cable is pulled into place, the cable grips shall be removed and any cable, which was sealed, shall be resealed.
- 2.4.9 MECHANICAL PULLING EYE: Mechanical pulling eyes assemblies, such as a posi-pull, shall be used on pulls calculated at greater 2,000 pounds but less than 10,000 pounds. Only assemblies manufactured and approved by the cable supplier shall be used. All sharp points and edges on the hardware attaching the pulling rope to the cable shall be taped to prevent snagging or damaging the raceway.
- 2.4.10 SWIVELS: A reliable nonfreezing type of swivel or swivel connection shall be inserted between the pulling rope and the cable pulling eye, grip or loop to prevent twisting under strain.
- 2.4.11 FEEDING TUBES: A 6-inch or larger steel pipe feeding tube, with a removable nozzle sized to fit the ducts, shall be used in pulling all underground cable. The feeding tube shall be long enough to extend from the duct entrance to the outside of the manhole and shall be so arranged that it will be impossible for the cable to drag across the edge of the manhole ring or any other damaging surface. The bending radius of the tube shall not be less than the minimum-bending radius of the cable to be installed.
- 2.4.12 PULLING TENSION: The pulling tension of any cable shall not exceed the maximum tension recommended by the cable manufacturer. Pulling mechanisms of both the manual and power types used by the Contractor shall have the rated capacity in tons clearly marked on the mechanism. Whenever the capacity of the pulling mechanism exceeds the recommended pulling tension of the cable as given by the cable manufacturer, a dynamometer shall be used to show the tension on the cable and the indicator shall be constantly watched. If any excessive strain develops, the pulling operation shall be stopped at once and the difficulty determined and corrected.
- 2.4.13 SIDEWALL PRESSURE: To avoid insulation damage from excessive sidewall pressure at bends, the pulling tension in pounds at a bend shall not exceed 300 times the radius of the bend in feet.
- 2.4.14 CABLE BENDS: The Contractor shall install the cable in such a manner that at no time is the cable bent to a radius less than the one specified by the cable manufacturer. In the event that it is discovered that the cable minimum-bending radius has been violated, installation shall be halted and PG&E notified of the occurrence. Installation of the cable may not proceed until the area where the excessive bending occurred has been examined under the direction of the cable manufacturer's representative and repaired, if necessary, according to the written instructions of the cable manufacturer. All costs, direct, indirect and incidental



which result from the cable being bent with too short a radius during installation shall be borne by the Contractor.

- 2.4.15 SUPPORTS: All cable supports and securing devices shall have bearing surfaces located parallel to the surfaces of the cable sheath and shall be installed to provide adequate support without deformation of the cable jackets or insulation
- 2.4.16 Cable may be pulled in a single pull through two sections of Engineer-designed raceway connected by a manhole only if it can be determined by calculation to the satisfaction of PG&E that the pulling tension will not exceed the maximum tension allowed by the cable manufacturer.
- 2.4.17 Cable shall be supported at all times without short bends or excessive sags and shall not be permitted to lie on the manhole floor.
- 2.4.18 Final inspection shall be made after all cable is in place and where supports deform the cable jacket, additional supports shall be provided as directed by PG&E's Representative. Additional cable protection such as a wrapping of light rubber belting, friction tape or similar material shall be provided where required.
- 2.4.19 Contractor shall furnish pulling sheaves as well as all other special tools needed for pulling cable. Pulling sheaves shall conform to the cable manufacturer's recommendations as to the diameter, shape and size of groove for the size of cable to be pulled, shall be of low friction design and the cable contact surfaces shall be lined with neoprene rubber
- 2.4.20 Contractor shall furnish all oils, greases and other lubricants required to pull cable and to place equipment in operation. The Contractor shall apply lubricants in accordance with the manufacturer's recommendations. Only lubricants recommended by the cable manufacturer and acceptable to PG&E shall be used. Lubricants shall be applied liberally and continuously during the pull.
- 2.4.21 Unless specified otherwise or acceptable to PG&E, cable shall not be pulled in a single pull through two sections of raceway connected by a manhole. Cable shall be pulled out at each manhole to the length required for termination. Prior to re-pulling of the pulled out cable, the cable shall be thoroughly inspected, cleaned and re-lubricated. Damaged cable shall be removed and replaced by and at the expense of the Contractor.
 - 2.4.21.1 The cable shall be continuous and unspliced between its entry into the equipment enclosure and the equipment.
 - 2.4.21.2 Cable removed from one duct shall not be pulled into another duct.
- 2.4.22 Contractor shall re-plug all ducts explored and not used during cable pulling and installation to the satisfaction of the PG&E Representative.

2.5 MARKING

- 2.5.1 Contractor shall verify locations and positions of all cable prior to marking.
- 2.5.2 Concrete pull boxes shall have the conduit designation stenciled with 1-inch letters on the inside before cables are installed. Junction boxes shall be stenciled with 2-inch letters on both sides and cover. Designations shall be applied as directed by PG&E. An oil base paint shall be used in stenciling. Black letters stenciled on a white background.



2.5.3 Contractor shall be responsible for making and installing all primary and secondary cable tags as required in the Marking section of the Electric Underground Construction Manual.

2.5.3.1 All tags must meet the requirements established in the Marking section of the Underground Standards Drawing number 033582.

2.6 SPLICING

2.6.1 Contractor shall perform all splicing Work in accordance with the splicing material manufacturer's recommendations and PG&E Design Standards.

2.6.2 Contractor shall ensure there is adequate slack in cable and the proper bending radius is not exceeded prior to splicing.

2.6.3 Whenever connections are made to aluminum, the joint shall be cleaned and a No-Ox-Id type compound shall be applied. Aluminum and aluminum to copper connections shall be made in accordance with Electric Underground Construction Manual Standard 015251.

2.6.4 **SPLICING MATERIALS:** PG&E shall provide packaged splice connectors for all splices installed. Contractor shall ensure that the splice is complete and in new condition prior to acceptance and installation.

2.6.5 Only a licensed journeyman cable splicer, journeyman lineman, or apprentice linemen/apprentice cable splicers supervised by journeymen shall perform splicing operations.

2.6.6 If the completed splice is not satisfactory, in the opinion of PG&E's Representative, it shall be removed and a new splice shall be properly installed, at the Contractor's expense.

2.6.7 Splices shall not be made to utilize short lengths of cable nor shall they be made to provide correct lengths on cable initially cut too short for a particular circuit.

2.6.8 Splices in cable shall be made only in enclosures and shall be made in accordance with the instructions of the cable manufacturer and PG&E Design Standards.

2.6.9 **SPLICES IN CABLE SHALL BE PREPARED IN A MANNER SIMILAR TO THE CABLE TERMINATIONS SPECIFIED BELOW.**

2.6.9.1 **LEAD OR LEAD TO PLASTIC TRANSITION SPLICES:** For lead-to-lead splicing or lead-to-plastic transition splicing, Contractor shall follow the requirements regarding certification and documentation.

2.6.9.2 Contractor shall submit their cable splicer's most current lead-to-lead or lead-to-plastic transition splicing certification whichever is appropriate for the Work as part of the Proposal. In the event, the Contractor does not employ cable splicers with a valid certificate at the time of proposal; Contractor will be ineligible to perform this Work. Only a cable splicer with a valid Cold-Shrinkable Straight Transition Splice (CAT J) Certificate can construct these splices.

2.6.9.3 **FOR LEAD TO PLASTIC TRANSITION SPLICES:** Contractor shall submit their cable splicer's most current certification from the Cold-Shrinkable Straight Transition Splice (CATJ) manufacturer TE



Connectivity (aka Raychem) or from 3M (for trifurcating splices) as part of the Contract or Proposal.

- 2.6.9.4 FOR LEAD TO LEAD SPLICES: Contractor shall submit their cable splicer's lead to lead certification from PG&E Learning Academy; which will serve as a proof of assessment in building either a 500C or 750C lead splice.
- 2.6.9.5 PG&E reserves the right to have the Contractor's certified cable splicers demonstrate their proficiency in lead or transition splicing prior to the start of Work; the certified cable splicers must be the individuals identified by name in the Contract.
- 2.6.9.6 The Work will be observed by a PG&E inspector, who will also have the same training and certification on file.
- 2.6.9.7 Contractor shall complete the Transition or Lead Splice Information Form for each completed lead or transition splice and shall be responsible for sending the completed form electronically to PG&E Representative within forty eight (48) hours of completing the Work. Invoices for such work shall not be valid, and rejected in full without submission of this form.

2.7 TERMINATION

- 2.7.1 Contractor shall perform all cable termination Work in accordance with the terms of this Paragraph 2.7 of the Specific Conditions and PG&E Design Standards.
- 2.7.2 Train cable in place and cut squarely to required length. Avoid sharp bends.
- 2.7.3 Remove necessary amount of cable jacket and insulation without damaging the cable.
- 2.7.4 Install terminals or terminal connectors as required, ensuring a firm metal-to-metal contact.

2.8 TESTING

- 2.8.1 If, for any reason, PG&E's Representative questions the integrity or quality of the installation or construction of the underground facilities, PG&E's Representative has full discretion and authority to require Contractor to perform associated testing. Contractor shall furnish the test procedures, the test instruments and qualified personnel required to perform the tests.
- 2.8.2 If it becomes necessary for Contractor to test the cable or equipment the following requirements shall be followed:
 - 2.8.2.1 All circuits shall be tested with the circuit complete except for connections to equipment. All splices and terminal connector attachments shall be complete prior to testing.
 - 2.8.2.2 Any circuit failing to test satisfactorily shall be replaced or repaired and then retested. All Work required to replace and repair circuit failing to pass the test shall be performed by and at the expense of the Contractor.
 - 2.8.2.3 Contractor shall furnish all equipment and labor required for testing.



- 2.8.2.4 The results obtained must demonstrate that the equipment and systems conform to the requirements of this Specification.
- 2.8.2.5 PG&E reserves the right for itself and/or its Representatives to be present and to witness all tests.
- 2.8.2.6 Contractor, at all times, must obtain permission from PG&E to perform tests when the system is connected to PG&E's electrical power system. The tests must be performed in a fashion to minimize unanticipated disturbances on the power system. These tests may have to be performed during the low load periods. Low load periods are defined as nights, weekends and fall and winter seasons as may be deemed appropriate by PG&E. Contractor shall provide a 10-day advance notice to PG&E's Representative.
- 2.8.2.7 Contractor shall provide PG&E's Representative with a full, written description and explanation if parts fail or are replaced during testing.

2.9 EQUIPMENT INSTALLATION AND GROUNDING

- 2.9.1 **GENERAL:** This Paragraph 2.9 covers the installation of all electrical equipment required to support a complete and fully operational underground electrical system. All Work shall include, but not be limited to, receiving, unloading, storing, removal from storage, hauling, cleaning, supporting and other work necessary to place all equipment into successful operation.
 - 2.9.1.1 **EQUIPMENT PROTECTION.** All equipment shall be protected from damage of any kind from the time it is unloaded until it is ready for initial operation.
 - 2.9.1.2 Contractor shall assemble all equipment shipped in an unassembled condition and ensure that all equipment is stored and maintained in accordance PG&E Design Standards, manufacturer's instructions and the satisfaction of PG&E's Representative.
- 2.9.2 **CLEANING:** The exterior and interior surfaces of each equipment item shall be cleaned of sand, dirt and other foreign materials after its removal from storage and immediately before its movement to its final location.
- 2.9.3 Before initial operation of individual items of equipment, the Contractor shall remove all dirt, grout and other material, which has been spilled, misplaced or otherwise, may damage the finished surfaces.
- 2.9.4 The interior of all electrical equipment, including relays and electrical contacts, shall be thoroughly wiped and vacuumed clean before the equipment is energized.
- 2.9.5 **EQUIPMENT FINISH:** Surfaces of most electrical equipment, such as panels, switchgear, transformers and circuit breakers, are finished at the factory. Great care shall be exercised to prevent damage to this original finish during installation of the equipment and during construction work.
 - 2.9.5.1 If the factory finish is damaged during the course of construction, the entire surface of the damaged component shall be refinished by and at the expense of the Contractor to the satisfaction of PG&E Representative.



- 2.9.5.2 The refinished surface shall be equivalent in every respect to the original surface, including color, texture and smoothness. Refinishing paint, if furnished with the equipment, may be used; otherwise, the paint shall be obtained from the equipment manufacturer.
- 2.9.6 **ALIGNMENT:** All cables and connectors shall be installed and connected in a manner that will prevent excessive stress on the equipment connections and casing.
- 2.9.7 All equipment shall be grounded with copper cable and tied to the main ground grid or ground rod.
- 2.9.8 All above ground connections shall be made with clamp type connectors or press connectors where required.
- 2.9.9 All connections shall be cleaned thoroughly with abrasive paper, cloth or wire brush at points of connection to insure good electrical connection.
- 2.9.10 Bare copper ground cable shall be taped before bending or cutting. Tape shall be removed after bending or cutting. Bend radius shall not be less than three times the diameter of the bare cable.

3.0 Grounding

For underground electric construction Work, Contractor shall comply with Section 3, Paragraph 5.17 of the Specific Conditions.



SECTION 5 CIVIL CONSTRUCTION

1.0 GENERAL

- 1.1** Section 5, Civil Construction of the Specific Conditions, describes the requirements pertaining to all Work related to installation of underground conduit facilities. Section 1 governs all the Work pertaining to this Section 5.
- 1.2** **SCOPE OF WORK:** The Work to be performed by Contractor includes, but is not limited to, furnishing labor, transporting to worksite, excavating for and installing, all conduit, vaults, and boxes, for PG&E or Joint Parties.

2.0 WORK TO BE PERFORMED BY CONTRACTOR

- 2.1** Performance of all Work by Contractor required for the construction of installation of the conduit, vaults, boxes and/or appurtenances shall be in accordance with the Contract and PG&E's Design Standards. When connected to existing PG&E Facilities, all Contractor-installed facilities shall support a fully operational underground electric distribution system.
- 2.2** Work may include the following:
 - 2.2.1** Determine centerline and box/vault locations and notify PG&E's Representative when the locations are ready for inspection. Contractor shall not proceed further until this Work has been approved by PG&E.
 - 2.2.2** Perform all trenching, excavation and shoring Work necessary for Contractor to install conduit, boxes, and appurtenances including, but not limited to, backfilling, compacting, compaction testing and hauling import and excess materials away from worksite.
 - 2.2.2.1** Cost of compaction testing shall be borne by Contractor. Contractor shall supply PG&E Representative with copies of all compaction test results prior to paving.
 - 2.2.3** Haul and handle all conduit, vaults, boxes, and appurtenances.
 - 2.2.4** Furnish all materials as specified in CWA.
 - 2.2.5** Align and join the conduit and all fittings, as appropriate.
 - 2.2.6** Prospect, excavate, lower, level, backfill and perform compaction for subsurface box/vaults installation including, but not limited to, all ladders, draw bolts, ground rods, sump pumps, sewer connections and other appurtenances.
 - 2.2.6.1** Contractor shall supply all materials and labor for cast-in-place box/vault construction including, but not limited to, all excavation, placement of rebar, forming, pouring, stripping formwork, backfill and compaction.
 - 2.2.7** Install primary and secondary conduit systems including, but not limited to, excavation and backfill; concrete encasement of conduits; and installation of primary and secondary splice boxes, enclosures, ladders, draw bolts, ground rods, etc.



- 2.2.7.1 All concrete and slurry, when required for covering conduit packages and bends, shall be considered a normal part of the trench installation to be provided at no additional cost to PG&E.
- 2.2.8 Install pre-cast concrete splice boxes, with extensions and covers as shown on Construction Drawings provided in the CWA.
- 2.2.9 Furnish and apply grout in between extensions and around conduit entrances as required.
- 2.2.10 Perform final testing of the completed conduit system and other services as specified herein. This includes, but is not limited to, proving the conduits with a flexible steel mandrel and inserting a 3/8" pulling tape with sequential markings in all conduits and capping open ends.
- 2.2.11 Assist PG&E in making tie-ins to existing PG&E facilities.
- 2.2.12 Provide all required tools, equipment, backfill material, shoring, steel-plating, traffic safety warning devices, temporary paving material, permanent paving material and concrete.
- 2.2.13 Install and compact all road base including, but not limited to, the furnishing of all required materials in accordance with applicable governmental rules, regulations, ordinances and any other applicable requirements.
- 2.2.14 Restore roadway, driveway and sidewalk surfaces removed during construction, including the furnishing of all materials required, to the satisfaction of the governmental agency or other parties having jurisdiction thereof.
- 2.2.15 Clean and leave the worksite in a presentable condition at the end of each workday, to the satisfaction of PG&E and agencies having jurisdiction thereof.
- 2.2.16 Restore area and landscaping to conform to the existing terrain.
- 2.2.17 Dispose all non-hazardous waste material. Disposal costs will be borne by Contractor.
- 2.2.18 Disposal of all hazardous material will be done in accordance with Section 1, Paragraph 13 and Section 2, Paragraph 2.0 of the Specific Conditions as well as the Contract.
- 2.2.19 After completion of all Work, restore the worksite to a condition equal to or better than conditions existing prior to construction and that meet the requirements of the jurisdictional or governing agencies issuing permits for said Work.
- 2.2.20 Obtain permitting agencies' sign off on all Work as a condition of acceptance by PG&E.
- 2.2.21 Provide complete applications and drawings for all special traffic permits if required.

3.0 WORK TO BE PERFORMED BY PG&E

PG&E will perform the following Work unless otherwise stated in writing:

- 3.1 Review and approve any changes to the proposed design and/or configuration prior to Contractor's implementation.



- 3.2 PG&E shall provide inspection services to verify acceptance of the Work.
- 3.3 PG&E shall provide excavation permits.

4.0 EXCAVATING, TRENCHING AND BACKFILL

"Excavation" means any operation in which earth, rock, or other material in the ground is moved, removed, or otherwise displaced by means of tools, equipment, or explosives in any of the following ways: grading, trenching, digging, ditching, drilling, auguring, tunneling, scraping, cable or pipe plowing and driving, or any other way. -California Government Code 4216(b).

Beginning January 1, 2016; PG&E will only hire excavation contractors who have become Gold Shovel Standard certified. The following Utility Standards provide guidance to contracting and using second party excavation to work on behalf of PG&E.

- Utility Standard: TD-5805S Damage Prevention Programs
- Utility Procedure: TD-5805P-02 Gold Shovel Standard – Damage Prevention Program Administration
- Utility Bulletin: TD-5805B-002

All Work necessary to trench, excavate, backfill and compact for the underground facilities, including, but is not limited to, conduit, gas pipes, transformer vaults and splice boxes, shall be performed and considered as included in the Work hereunder. Any Work not performed in accordance with the Contract and to the satisfaction of PG&E's Representative shall be immediately corrected or replaced by the Contractor to the satisfaction of PG&E's Representative at no additional cost to PG&E.

4.1 TRENCH EXCAVATION

- 4.1.1 Contractor shall give PG&E's Representative written notification at least 5 working days prior to start of trenching and shall orally confirm the start date with PG&E's Representative 2 working days before start of trenching. **NOTE:** Contractor shall notify PG&E Representative 72 hours in advance of any Work to be performed in or around energized vaults, equipment or conductors, when said Work will require placement of protective coverings or devices.
- 4.1.2 Contractor shall sawcut all trenches in paved areas prior to excavating.
 - 4.1.2.1 The removal of pavement, sidewalk, parking strip and other roadway structures shall be performed by Contractor in accordance with the county, city, municipality or local governing agency's regulations. Sawcuts in concrete pavement and parking strips shall be of sufficient depth to provide neat, regular and vertical edges. When such excavation is made in streets where the existing pavement is due to be reconstructed or is in visibly poor condition, the use of a saw may be omitted when written approval from the county, city, municipality or local governing agency has been obtained.
 - 4.1.2.2 **OVERCUTTING IS NOT ALLOWED:** Contractor shall cut to the exact boundaries of the excavation and break out excess material at the corners within those boundaries if necessary. Contractor is responsible for replacing sidewalk or driveway paving damaged/lost as a result of Contractor's workmanship.
- 4.1.3 Minimum excavation depths and widths shall be as specified on PG&E and Joint Party Construction Drawings attached in the CWA. Contractor shall make excavations to dimensions necessary to maintain specified separation of facilities



and to provide the minimum cover specified herein, regardless of existing field conditions.

4.1.3.1 All excavations shall be measured from bottom of ditch to the existing street, gutter or sidewalk.

4.1.3.2 Minimum cover shall be measured from top of conduit to finish grade of proposed improvements.

4.1.4 Contractor shall ensure that trench bottoms and excavation for and spread of coarse rock (gravel) for placement of substructures are level, flat and without surface irregularities and shall be clear and free of debris at the time the trench or excavation is made available for placement of facilities or substructures, respectively. Any trench elevation change shall be by gradual transition and not by abrupt drops.

4.1.5 **SHORING:** Contractor shall furnish and install shoring as required by Cal/OSHA regulations or as needed to support any excavation in a safe and stable condition. Shoring shall be removed after use. Shoring shall conform to Cal/OSHA specifications.

4.1.5.1 If it is necessary for a PG&E employee to enter a shored hole in order to perform Work, Contractor shall furnish and install additional shoring to meet any additional PG&E standards.

4.1.5.2 **Shoring and Plating:** Shoring shall be used in all excavations five (5) feet or greater in depth and in shallower excavations whenever unstable soil conditions exist. All excavations existing at the end of the workday shall be covered with contractor-provided steel plates to allow traffic to return to its normal pattern.

4.1.5.2.1 All steel plates shall be non-skid and equipped with a centered ACME thread or coil thread coupling. No other lifting devices or methods will be approved.

4.1.6 **FACILITY CLEARANCE:** The Contractor shall, without compensation for extra depth of ditch, dig the trench to additional depth where the PG&E and Joint Party Facilities may be laid at least 12" either under or over known or unknown existing utility lines, sewers, storm drains, water mains or telephone conduits, etc. A greater minimum distance between facilities being installed and existing facilities may be required by governmental regulation or may be specified in a CWA. Contractor shall ensure that all existing utility lines or service stubs are located and exposed, by hand digging only.

4.1.7 **Bellhole Excavation:** Prior to placing the pipe in the trench, Contractor shall excavate each bellhole of such size and location so that adequate room will be provided for the performance of all required Work within specified safety standards.

4.1.7.1 **BELLHOLE EXCAVATION FOR PG&E WORK, TIE-INS:** Width, length, depth and shoring shall be inspected and authorized by the PG&E Representative prior to PG&E crews arriving to perform Work.

4.1.8 **DRAINAGE OF EXCAVATION:** Contractor shall perform all Work necessary for the control and disposal of all surface and subterranean water to such extent and for such time as is necessary to keep water from interfering with the progress, efficiency and quality of the Work. Disposal of such water shall be in accordance



with all applicable Federal, State and Local laws, rules, regulations, orders and ordinances.

- 4.1.9 ROAD CROSSINGS: Contractor shall construct all open-cut road crossings in accordance with the restrictions and requirements of the public or private agency having jurisdiction thereof. All temporarily paved road crossings shall have a minimum of 2" of asphalt material in the traveled sections.
- 4.1.10 TRENCH CROSSING: Contractor shall provide trench crossings wherever necessary to permit the public, property owners or tenants to move across excavated trenches traversing public streets or private property. The temporary bridgework shall be of adequate strength, properly installed and constructed to insure the safe flow of traffic.
- 4.1.11 TRENCH MAINTENANCE: During the performance of Work, Contractor shall be responsible for maintaining the excavated trench in satisfactory condition. In the event something occurs which jeopardizes the integrity of the trench, including but not limited to inclement weather, cave-in or if the trench fails or fills with water, it is Contractor's responsibility to do whatever is necessary to restore the trench to acceptable condition and restore the existing and new Facilities found in the trench to their appropriate trench configuration without any additional cost to PG&E.

4.2 DISPOSAL OF SURPLUS EXCAVATED MATERIAL

- 4.2.1 Contractor shall be responsible for properly disposing of all surplus excavated materials. The method of disposal shall be to the satisfaction of the governmental agency having jurisdiction thereof and PG&E's Environmental General Management Practices.
- 4.2.2 Spoil Placement: Trenching spoil shall be placed by Contractor so as to not interfere with existing Facilities.

4.3 BACKFILLING AND COMPACTION

- 4.3.1 The Contractor shall verbally notify PG&E's Representative upon completion of the Facility installation in the trench. PG&E Representative will inspect the Work and either approve it or disapprove it. Backfilling of said trench or level thereof shall immediately commence upon approval of the PG&E Representative and Joint Parties.
- 4.3.2 No backfilling shall be done until all Facilities are placed in the trench (or on a particular level) and inspected by PG&E and each of the Joint Parties to ensure proper separation and/or required cover achieved. If any backfilling is performed without approval, PG&E Representative shall have the right to require removal of the backfill without any additional cost to PG&E.
- 4.3.3 PADDING: The bottom of the trench shall be cleared of rocks or other hard substances and a sand cushion of at least 4" is required as a pad on which electric conduit, or other Facilities can rest.
 - 4.3.3.1 For conduit installation only, the sand pad is not required if the bottom of the trench consists of rock free native sand.
- 4.3.4 The padding and backfill material for joint trench or substructure excavation is to be supplied by Contractor. The material shall be 100% sand. However, if allowed by PG&E's Representative and agencies having jurisdiction, Contractor



may use the soil originally excavated from the trench, but only after it has been screened free of rocks and debris as required herein. Such backfill material shall be in a natural state, screened free (No. 4 screen) of rocks, wood, roots or vegetation or any other deleterious matter. However, the backfill material for that portion of the trench more than 6 inches above the uppermost utility facility may be of native spoil, crusher run, crushed rock, gravel, sand or a mixture of these, provided such materials meet the approval of PG&E's Representative and local governing agencies. NOTE: Selected backfill or import, when required for padding, shading or filling the trench, shall be considered a normal part of the joint trench installation to be provided at no additional cost to PG&E.

- 4.3.4.1 Corrosive material shall not be placed in excavation where such material may damage or contribute to the corrosion of the Joint Party facilities. Materials found to have corrosive properties shall be immediately removed from the excavation and replaced with a clean backfill material. All repairs associated with damage caused by the corrosive materials, along with removal, off-haul and dump fees shall be at Contractor's expense, at no cost to PG&E.
- 4.3.4.2 Backfilling over concrete-encased conduit shall not proceed until concrete has "set-up" or is firm to the satisfaction of the PG&E Representative. A sand cushion of at least 6" is required as a pad between gas facilities and concrete encasement.
- 4.3.4.3 Contractor shall install a 6" wide by 4 mil thick polyethylene trench marking tape in a continuous strip over the entire length of the trench 12" above the highest utility. The tape shall have 2" high black lettering stating "BURIED UTILITY LINES BELOW" on an orange background. The cost of the tape and its installation shall be included in the price for trench excavation.
- 4.3.5 Compaction of backfill will be required throughout the worksite, including highways, streets, driveways, railroad crossings, banks of creeks, canals and ditches. Compaction will be performed in accordance with property owner and/or tenant agreements and jurisdictional agency permits. The material shall be carefully placed and thoroughly compacted to the satisfaction of the agency having jurisdiction thereof. CONTRACTOR SHALL GUARANTEE ALL BACKFILL AGAINST SETTLEMENT FOR A PERIOD OF TWO YEARS FROM THE DATE OF ACCEPTANCE.
 - 4.3.5.1 Compaction of the backfill material shall not begin until a minimum of 6" of cover is placed over the facilities.
 - 4.3.5.2 Multilevel trench: The PG&E Representative shall approve the clearances between new facilities on each level as specified on the composite drawings attached to CWA, prior to installation of any backfill or performance of any compaction.
 - 4.3.5.3 To prevent differential settlement, extra care should be taken to provide proper compaction under conduits, pipes and fittings at branch and transition locations.
- 4.3.6 COMPACTION: Unless otherwise specified or required by local ordinance, backfill material shall be compacted in six-inch minimum lifts to 95% relative compaction (California Impact Method No. 216). The method of achieving such



compaction is limited by Paragraph 4.3.7 below or by local agencies having jurisdiction thereof.

- 4.3.7 Compaction Methods: Acceptable compaction methods are hand tamping with pneumatic or vibrating equipment. Contractor shall not use a compaction method that may cause damage to any Facilities, including Facilities of PG&E and/or other Joint Party.
 - 4.3.7.1 Compacting with a hydrammer or heavy vehicle shall be limited to the top 6" of the trench, unless otherwise authorized by the PG&E Representative.
 - 4.3.7.2 Water jetting or adding water to the sand backfill material once it is placed into the trench is permitted, as long as it does not cause facilities to move or be undermined.
- 4.3.8 COMPACTION TEST: Contractor shall make all necessary arrangements for compaction tests by a qualified third party testing firm. Contractor shall incur all expenses for compaction testing and meeting said requirements.

4.4 RESTORATION OF WORKING AREA

- 4.4.1 Contractor shall bear all costs to replace all excavated material and landscaping in the worksite.
- 4.4.2 Contractor is responsible for the repair and/or replacement of any traffic loops damaged or removed during Work.
- 4.4.3 Contractor shall provide and install all temporary road markings as specified by the local agencies having jurisdiction thereof.

4.5 CLEANUP

- 4.5.1 Contractor shall wash down the worksite immediately after sawcutting. Perpendicular street crossings shall be washed down as the cutting progresses across the street. Sawcutting residue shall not be allowed to enter the storm drain system. Contractor shall ensure that a filter or boom is placed at all catch basins receiving the wash water to trap sawcutting residue. All trapped residue shall be removed by Contractor and disposed of in accordance with all applicable laws, rules, regulations and requirements. The washing methods shall meet all requirements of the governmental agencies having jurisdiction and must be approved by PG&E. Wash down procedures will be performed at Contractor's expense.
- 4.5.2 All private property including, but not limited to, fences, private roads, irrigation and drainage structures, shall be left in good repair. Where removed property must be replaced, the replacements shall be of the same or better quality than original materials and workmanship and shall be compatible with the original property. All such Work shall be performed to the satisfaction of PG&E, as well as the property owner and/or the tenant and jurisdictional agencies.
- 4.5.3 Cleanup activities shall follow within a reasonable distance of the completed backfilling operation at all times. PG&E may direct Contractor to stop all work except backfilling and cleanup when the final cleanup and/or backfilling of the trench, in the opinion of PG&E Representative, lags behind the joint trench installation Work.



- 4.5.4 Unless otherwise specified herein, Contractor shall dispose of all refuse material, including but not limited to scrap, stumps, tree trunks, branches, brush, asphalt and concrete, by disposal off the worksite at a point or points as approved by PG&E's Representative. Said disposal shall be done in accordance with all applicable laws, rules, regulations, ordinances, orders and permits of the governmental agencies having jurisdiction thereof.

5.0 CONDUIT AND SUBSURFACE ENCLOSURES

- 5.1 Installation of underground facilities includes, but is not limited to, conduit and subsurface enclosures. Installation shall be performed in accordance with PG&E Design Standards.

- 5.1.1 Subsurface Enclosures: Contractor shall install underground enclosures that are made of either concrete or fiberglass and are used to house, wire splices, switches, transformers or other electric equipment. Other names include, but are not limited to, boxes, manholes, splice boxes, enclosures, vaults or utility boxes.

- 5.1.2 All Contractor's workmanship and materials shall comply with PG&E and Joint Party specifications in every respect and shall meet all pertinent requirements of General Order No. 128 of the California Public Utilities Commission.

5.2 CONTRACTOR'S RESPONSIBILITIES

- 5.2.1 Contractor shall not enter or perform Work in Subsurface Enclosures containing energized cable or equipment unless a qualified PG&E employee is present. All such existing cable or equipment shall be considered energized until such time as a qualified PG&E employee determines otherwise.
 - 5.2.2 Details shown on the Construction Drawings are for typical installations. In some cases, the actual substructures, tie-in pieces, alignment, etc. may deviate from that shown on the detail drawing. Changes from these details required to facilitate construction will be considered a normal part of construction and shall be provided at no extra cost to PG&E.

5.3 SUBSURFACE ENCLOSURES

- 5.3.1 Concrete and fiberglass boxes shall be installed as shown on drawings. Conduit entrances, draw bolts, sumps, ground rods and other hardware shall be installed at locations as required by drawings. Covers shall be marked "PG&E".

- 5.3.1.1 No Concrete and Fiberglass boxes shall be installed directly over the joint trench.

- 5.3.2 Concrete and fiberglass boxes shall have knockouts for all conduits entering boxes. If special knockout locations are required, they shall be made and located as shown on the Construction Drawings.

- 5.3.3 Concrete and fiberglass boxes shall be installed in accordance with the Construction Drawing and to established or existing grade as required in PG&E Design Standards. Contractor shall guarantee against settlement and/or improper placement for a period of 2 years from completion of Work.

- 5.3.4 PG&E subsurface transformer enclosures, splice boxes, vaults and switch enclosures shall be installed as per PG&E Electric Underground Construction Manual Drawing Numbers 028028 and 062000. Work shall include the installation of 8 foot or 12 foot ground rods. Ground rods shall be driven into



ground through bottom of box, enclosure or vault. All PG&E subsurface transformer enclosures, splice boxes, vaults and switch enclosures shall be installed over a 6" thick bed of compacted 3/4 inch drain rock.

- 5.3.4.1 All labor, material and equipment costs required to install ground rods shall be included in Contractor's price for installing PG&E primary splice boxes, transformer enclosures and vaults.

5.4 CONDUITS

- 5.4.1 Conduits shall be PVC Schedule DB120 (if 2-1/2" or larger) or rigid steel and shall terminate no less than 1" above the finished surface grade at a location on the pole in quadrant indicated on the construction drawings. For Directional Boring applications, conduit shall be High Density Polyethylene Directional Boring Conduit or Bore-Gard Directional Boring Conduit.
 - 5.4.1.1 If it becomes necessary to grout or slurry multiple conduits installed inside of a casing, Contractor shall provide and install PVC Schedule 40 conduit and all necessary spacers for the length of the casing.
- 5.4.2 All conduits shall be inspected by PG&E's Representative before being lowered into the trench. All damaged portions shall be repaired by Contractor in accordance with the terms of the PG&E Design Standards. The conduit sections shall be carefully placed in the trench in a manner approved by PG&E; under no circumstances shall conduit be forced or dropped into the trench.
- 5.4.3 Before being backfilled or shaded, the conduit must rest on the bottom of the trench for the entire length of the section, except when entering a splice box, vault or enclosure.
 - 5.4.3.1 Whenever possible, all conduit shall be installed so it drains back toward the enclosures.
- 5.4.4 All conduit shall be grouted in place where it enters a box. The box shall be cleaned of any excess grout resulting from this operation. Contractor shall incur all costs associated with core sawing operations required to provide holes in splice boxes, vaults or enclosures for conduit entry.
- 5.4.5 Plastic conduit cutting, fitting and gluing shall be performed in accordance with the PG&E Design Standards.
- 5.4.6 Rigid steel conduit, if required, shall be installed with threaded couplings and joints tightly connected. Where the ends are not threaded, a galvanized steel split coupling and galvanized steel bolts may be used. Conduit shall not be cut with a torch, welded or brazed. However, under certain conditions as determined by PG&E's Representative, ground wires may be brazed to the conduit.
- 5.4.7 Because the conduits have different inside diameters which may result in a sharp edge where joined, transitions from one type or size of conduit to another shall only be made at splice boxes, enclosures, manholes or vaults.
- 5.4.8 Contractor shall install Bell-End type couplings at locations deemed necessary due to bending of conduits to match trench line.
- 5.4.9 Extreme care shall be exercised to ensure that concrete and other foreign matter does not enter the conduit while conduit is being laid, while concrete is being poured or anytime thereafter. Contractor shall prove all conduit to ensure that it



is free of obstructions, dirt, rocks, etc., by means of a mandrel. The mandrel diameter shall be no less than 1/2" smaller than the inside diameter of the conduit. For straight runs and long sweeps, the mandrel length shall be 1 foot. A flexible or spherical-type mandrel may be used only on runs that contain a radius bend of 36" or less.

5.4.9.1 If conduit cannot be proved utilizing an approved mandrel, Contractor shall be required to determine cause of obstruction and remedy problem prior to acceptance by PG&E.

5.5 CONDUIT BENDS

5.5.1 Bends in conduit shall be as indicated in job estimate, drawings and as required per Design standards.

5.5.2 The total number of bends installed in any conduit run shall not exceed 300 degrees, including the bend at the feed in location.

5.6 PULL LINES

5.6.1 Contractor shall provide and install a 3/8" minimum polypropylene pull tape with sequential markings having a minimum breaking-strength of 800 lbs. along the entire length of all conduits except service conduits. The pull tape shall be secured at each end of conduit section.

6.0 PAVING AND CONCRETE WORK

6.1 PAVING

6.1.1 Contractor's paving and concrete Work shall be performed in accordance with the terms of the Contract.

6.1.2 Responsibility: Contractor shall be responsible for replacing street pavement and/or concrete sidewalk or driveway where damaged as a result of its operations. Contractor shall replace sub-grade and surfacing in a manner and with materials satisfactory to the specifications of the local governing agency having jurisdiction.

6.1.3 Contractor shall replace concrete and/or paved surfaces within one week or in accordance with the specifications of the local governing agency having jurisdiction, whichever is more stringent.

6.1.4 Contractor shall guarantee all paving and concrete Work against all defects for a period of two years from the completion of Work. In the event the surfacing settles, cracks or develops other defects within two years, Contractor shall repair or replace the damaged surface at its own expense. In the event Contractor fails to repair or replace the damaged surface in a timely manner, PG&E may repair or repave or hire another contractor to repair or repave, at Contractor's expense.

6.1.4.1 Reimbursement: In the event the local governing agency does the paving described in this Section 5, Paragraph 6.1.4, Contractor shall be responsible for payment directly to that agency.

6.1.5 Contractor is responsible for providing and maintaining temporary repairs to paved and/or concrete surfaces, subsequent to backfilling and prior to the making of permanent paving and concrete work.



6.1.6 All permanent paving shall correspond to the contour of the existing street. Any deviation from the natural street contour will not be allowed.

6.1.7 All trench edges shall be sealed by hot asphalt mix "trim" 2 inches thick. Such edges shall be sealed by a hot iron or other device to prevent the infiltration of water or other substances that might cause sub-base compaction problems or paving damage.

6.2 CONCRETE WORK

6.2.1 All concrete Work shall meet permit agencies' requirements and shall match existing sidewalk in both color and alignment.

6.2.2 Concrete forms shall be such as to obtain a surface finish that is reasonably smooth and free from defects that would impair the durability of the concrete. Forms shall be constructed to obtain accurate shapes, lines and dimensions of the concrete. Forms shall be mortar tight and properly connected and braced for adequate strength and stability. All forms shall be removed by Contractor, except as otherwise authorized by PG&E and holes in the concrete caused by removal of form accessories shall be filled tightly with mortar.

6.2.3 Reinforcing bars shall be deformed structural or intermediate grade billet steel. Bars shall be accurately shaped and positioned and shall be securely fastened to prevent movement when the concrete is placed. Laps shall be not less than 30 diameters.

6.2.4 Concrete mix, strength, quality and all other specifications shall be per applicable law, ordinance, regulation, permit and good industry practice.

6.2.5 All ingredients shall be thoroughly mixed. Concrete shall be recompact as it is placed and manipulated with suitable implements until it is free of voids, completely contacts all surfaces and has obtained a practicable maximum consolidation and density. Unformed surfaces shall be finished to a smooth surface with exposed edges rounded.

7.0 HORIZONTAL DIRECTIONAL DRILLING

7.1 HORIZONTAL DIRECTIONAL DRILLING (HDD) PROCEDURE

7.1.1 GENERAL

7.1.1.1 Purpose: To outline requirements for horizontal directional drilling (HDD) as it pertains to equipment, set up procedures, grounding, bore hole design, reaming, fluids, handling of conduit, and operational and logistical data.

7.1.1.2 Contractor Responsibilities

7.1.1.2.1 Contractor shall provide all prospecting, pre-camera inspection, temporary and permanent paving, excavation, shoring, backfilling, compaction, conduit and subsurface enclosure installation, and backfilling the Work subsequent to the making of tie-ins to existing facilities by PG&E and tasks necessary for a complete and correct installation of the facilities. Contractor shall be responsible for disposal of excavated material and the drilling liquids.



- 7.1.1.2.2 Contractor shall determine and provide a boring rig of a type and model that is appropriate for the Work.
- 7.1.1.2.3 Contractor shall provide drill and pullback services that do not damage the conduit or other substructures.
- 7.1.1.2.4 Contractor shall coordinate and schedule HDD with PG&E's Representative and other Contractors as needed.
- 7.1.1.2.5 Contractor shall create a final design of borehole trajectory and reaming plan for approval by PG&E.
- 7.1.1.2.6 Contractor shall locate entry and exit points and establish alignment of the HDD segment to improve its constructability, or to meet other objectives.
- 7.1.1.2.7 Contractor shall secure a water source and dispose of drilling fluids.

7.1.2 EQUIPMENT

- 7.1.2.1 HDD equipment shall be in good, safe operating condition with sufficient supplies, materials, and spare parts on hand to maintain the system in good working order for the duration of the project. Contractor shall maintain an inventory of equipment and materials on hand at the drilling site in the event of a Frac-out, the condition where drilling mud is released through fractured bedrock into the surrounding rock and sand and travels toward the surface.
- 7.1.2.2 HDD Method shall incorporate a system that will allow tracking of the HDD drilling head for the entire length of the bore.
- 7.1.2.3 Contractor shall determine suitable guidance system, drill head, and locating system in accordance with the Work requirements and the manufacturer specifications.
- 7.1.2.4 Drilling Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations; it shall be grounded during drilling and pull-back operations; it shall contain capacity to perform the bore and pullback the conduit.
- 7.1.2.5 Drill pipe shall be inspected regularly for wear and sections exhibiting bending; thread damage or excessive wear shall be replaced prior to commencement of drilling operations. Contractor is responsible for replacement of drill pipe.
- 7.1.2.6 REMOTE LOCKOUT: All Contractor HDD equipment should have a tested, and working, "remote lockout" unit. This safety feature shall be utilized anytime a HDD crewmember needs to be in direct contact with the drilling head. These units may be "built in" to the unit or an "add on" accessory upgrade.
- 7.1.2.7 DRILLING FLUIDS: Contractor shall use all necessary drilling fluids and additives specific to site ground conditions on a continuous basis during all drilling operations. Drilling fluids shall provide a drilling fluid mix, delivery and recovery system of sufficient capacity to successfully complete the crossing.



- 7.1.2.7.1 Drilling fluid shall be composed of clean water and appropriate clay additives and viscosity levels. Water shall be from an authorized source with a neutral pH.
- 7.1.2.7.2 Contractor shall supply Material Safety Data Sheets (MSDS) for all material used in making up drilling fluids. The drilling fluid composition must meet all federal, state and local laws and environmental regulations governing the use, handling, storage, and disposal of such material. No potentially hazardous material may be used in drilling fluid.
- 7.1.2.7.3 **DISPOSAL OF DRILLING FLUIDS:** Disposal of excess drilling fluids is the responsibility of Contractor and shall be conducted in compliance with all environmental regulations, right-of-way and workspace agreements, and permit requirements. All costs related to disposal shall be the responsibility of Contractor.
 - 7.1.2.7.3.1 Drilling fluid disposal procedures proposed for use shall be submitted to PG&E for approval. No procedure may be used which has not been approved by the appropriate PG&E representative.
 - 7.1.2.7.3.2 Boring liquid and residue shall not be allowed to enter the storm drain system. Contractor shall take precautionary measures and ensure placement of prevention devices. Contractor shall clean up storm drain system if needed.
- 7.1.2.8 **DRILLING FLUID DELIVERY SYSTEM:** The fluid pumping system shall have a minimum capacity of 35-500 GPM. The minimum volumetric flow rate shall deliver the drilling fluid at a constant minimum pressure of 1200 psi that is consistent with the soil strata and the drilling fluids plan. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free.
 - 7.1.2.8.1 **CONTAINMENT OF DRILLING FLUIDS:** Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. If required, a berm, minimum of 12 inches high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.
- 7.1.2.9 **DRILLING FLUID RECYCLING SYSTEM:** Drilling fluids may be used in a recycling system to remove solids from the drilling fluid so that the fluid can be re-used. If recycling is utilized, the drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid shall be stockpiled for later use or disposal.



- 7.1.2.10 **MAGNETIC GUIDANCE SYSTEM:** A Magnetic Guidance System (MGS), or an electronic "walkover" tracking system, shall be used with the HDD system and meet these requirements:
- 7.1.2.10.1 Provide a continuous and accurate determination of the location of the drill head during the pilot operation.
 - 7.1.2.10.2 Track at all depths up to one hundred feet and in any soil condition, including hard rock. It shall have a probe or proven (non-experimental) gyroscopic probe and interface for a continuous and accurate determination of the location of the drill head during the drilling operation; it shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction).
 - 7.1.2.10.3 Be calibrated to manufacturer's specifications or $\pm 2\%$ of the vertical depth of the borehole at sensing position at depths up to 50 feet and accurate to six (6) inches horizontally.
- 7.1.2.11 In sensitive areas, Contractor may be required to have a vac-truck continuously on-site during drilling operations to recover drilling fluids in the case of a frac-out. In addition, and particularly as the pilot hole approaches the exit point, Contractor may be required to have a backhoe positioned over the HDD borehole, on standby, to help contain a frac-out.
- 7.1.2.11.1 In non-sensitive areas, a vac-truck shall be available on short notice but not necessarily on-site at all time.
 - 7.1.2.11.2 Contractor shall make multiple units, as referenced above for use on a single project or on multiple projects through the PG&E territory as required by the Work.
 - 7.1.2.11.3 **Restricted Equipment**
 - 7.1.2.11.3.1 Consideration for approval will be made on an individual basis for each specified location.
 - 7.1.2.11.3.2 Contractor shall provide water pumps, hoses, fittings, storage tanks, filters, hay bales, silt fencing (as required), drilling fluids containment, collection, cleaning and disposal equipment and material, fuel and lubricants.
- 7.1.3 **SET-UP**
- 7.1.3.1 **Job Site Access and Work Space:** Unless otherwise required in the Project Specific Conditions, workspace and access will be acquired by PG&E and defined on the Construction Drawings. In the event the work space provided conflicts with Contractor's logistical needs, Contractor shall alter construction practices to meet existing spatial



requirements or acquire additional temporary working space. Additional workspace and access may be acquired by Contractor only with PG&E review and approval. The expense of acquiring additional workspace shall be borne by Contractor.

7.1.4 RIG STABILIZATION

Rig Stabilization: Contractor shall construct a "dead man", type of anchor, as required to support and stabilize the drilling and pipe pulling equipment.

7.1.5 GROUNDING EQUIPMENT: Contractor is responsible for all necessary grounding to ensure safety or protection of facilities from potential hazards and shall ground in accordance with applicable safety laws and in accordance with acceptable electrical industry standards.

7.1.5.1 Specifically, Contractor shall ground in compliance with Title 8, Division 1, Chapter 4, Subchapter 5, Group 2, Article 36, Section 2941, (i) of the California Code of Regulations per manufacturer's recommendations.

7.1.5.2 These provisions shall not prevent Contractor from furnishing and installing as many additional grounds as it deems necessary for the protection of its own personnel against static and accidental contacts with energized circuits.

7.1.5.3 If a conductor or apparatus is not grounded, it must be considered as energized and so treated.

7.1.5.4 There shall be a system to detect electrical current from the drill string and an audible alarm, which automatically sounds when an electrical current is detected. Strike alert shall be activated and maintained at all times and used in accordance with Operator's manual and/or manufacturer's recommendations and guidelines.

7.1.5.5 Dielectric Boots: HDD Operator and Locator shall both wear dielectric boots during the HDD "drill out" and "pull back" process.

7.1.6 PILOT HOLE

The pilot bore shall be drilled along the bore path in accordance with the grade, alignment, and tolerances specified in the Contract. In the event the pilot bore does deviate, the Contract Administrator shall be notified. PG&E Representative may require Contractor to pullback and re-drill from the location along the bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns, or loss of circulation occurs during pilot bore drilling operations, the PG&E Representative shall be advised of the event and of the action taken.

7.1.6.1 Conflicts: In the event down-hole conditions change or unanticipated obstructions occur, only PG&E may alter any design parameters. Contractor shall thoroughly document all field changes requested and approved.

7.1.6.2 Tolerances:

7.1.6.2.1 Elevation: Plus 0 feet, minus 30 feet.

7.1.6.2.2 Alignment: Plus or minus 10 feet.



- 7.1.6.2.3 Entry Point Location: The pilot hole shall initially penetrate the ground surface at the exact location shown on the Drawings. Operator or Contractor shall angle entry hole so that curvature of pilot hole does not exceed allowable bending radius of conduit to be installed.
- 7.1.6.2.4 Exit Point Location: The pilot hole shall finally penetrate the ground surface within plus or minus 1.5 feet of the alignment shown on the Drawings and within plus 50 feet and minus 0 feet of the length shown on the Drawings.
- 7.1.6.3 Curve Radius: The pilot hole shall be drilled at a radius of no less than the radius specified in the Project Specific Conditions.
- 7.1.6.4 Installed Radius of Curvature: The drilled radius will be calculated over any three-- joint (range 2 drill pipe) segment using the following formula:
- $R_{drilled} = (L_{drilled}/A_{avg}) * 57.32$
Rdrilled = drilled radius over Ldrilled
Ldrilled = length drilled, no less than 75 feet and no greater than 100 feet
Aavg = total change in angle over Ldrilled
- 7.1.6.5 Conductor Barrel: If un-cohesive soils are found in the upper strata (peat, etc.), Contractor shall install a Conductor Barrel to adequate depths at both the entry and exit points in order to minimize the potential for loss of circulation and inadvertent returns. The barrel shall be of adequate size (usually 1.5 times the diameter of the bore string) to prevent damage to the coating when pulling back through the Conductor Barrel. If Contractor's Geotechnical Engineer warrants that these measures are not required and that other mitigations will reduce the probability of frac-out, this requirement may be waived.

7.1.7 PROSPECTING

- 7.1.7.1 Contractor shall perform all Work and provide all equipment necessary to bore in conduit as directed by the PG&E Representative in accordance with the county, city, municipality or local governing agency's regulations. Work shall include all saw cutting, breakout, removal, vacuum excavating, exposing, measuring, mapping, backfilling, compacting, compaction testing, and installation of temporary paving.
- 7.1.7.1.1 Contractor shall perform all prospecting and exposure of facilities in accordance with the requirements set forth in PG&E Utility Work Procedure TD-4412P-05, Excavation Procedure for Damage Prevention, with the exception of Section 8. This Section 8 is deleted in its entirety and is replaced with the procedure as set forth in Utility Bulletin TD-4412B-012, Cross Bore Preventive Requirements.
- 7.1.7.1.2 Contractor shall utilize PG&E Utility Bulletin TD-4412B-012, Cross Bore Prevention Requirements, in its performance of Work on bore inspection to prevent cross bores when installing facilities near sewer, storm drains



and other utilities.

7.1.7.2 **ALIGNMENT:** All lateral crossings must be prospected to ensure clearance. All mainline and service laterals within 24 inches of the bore's centerline must be fully exposed. Contractor shall ensure clearance is maintained during the boring, reaming, and installation process. Contractor shall adjust to accommodate when needed. Boring shall be performed in such a way as to align the installed facility with the existing facilities to be tied in.

7.1.7.2.1 Contractor shall not damage or realign any facilities during the boring, excavation, backfill, and compaction process.

7.1.7.2.2 CWA shall provide construction drawings that details typical installations. In some cases, conduit, enclosures, cable, alignment, etc. may deviate from that shown on the detail drawing. Changes from these details required to facilitate construction shall be considered a normal part of construction and shall be provided at no extra cost to PG&E.

7.1.7.2.3 Determine alignment and notify the PG&E Representative when the route is ready for inspection. Contractor shall not proceed further until this Work has been approved by PG&E.

7.1.7.2.3.1 Contractor shall be responsible for marking offset marks from given centerline. It is Contractor's responsibility to protect centerline marks.

7.1.7.2.3.2 Cover shall be measured from top of conduit or casing to finish grade of proposed improvements.

7.1.7.3 PROSPECTING SEWER MAINS AND SEWER LATERALS

7.1.7.3.1 Sewer systems are especially vulnerable to damage from directional drilling operations for the following reasons: lines are often non-metallic, making them difficult to locate, and clean-outs or other indications of laterals may be hidden or non-existent.

7.1.7.3.2 Contractor shall consider and perform the following additional measures to locate sewer mains and crossings:

7.1.7.3.2.1 Visually check the job site for sewer cleanouts, manhole covers, and any markings on curbs or gutters that may exist for sewer facilities.

7.1.7.3.2.2 Use internal camera systems that travel down the main sewer line and allow the laterals to be located visually.

7.1.7.3.2.3 Use electronic technology to track a locating transmitter inserted into a sewer and/or



lateral to determine its path and depth.

7.1.7.3.2.4 Obtain access to buildings that do not have an outside clean out and visually identify where the sewer exits the structure. Visually determine the depth of the sewer lateral by identifying where the lateral exits the building versus the depth of the sewer main at the street.

7.1.7.3.3 If Contractor cannot positively locate sewer mains and laterals, or if visual verification cannot be made, then, in addition to notifying the PG&E Representative, the following alternatives must be used:

7.1.7.3.3.1 Perform a post-construction camera inspection of all possibly affected sewer lines.

7.1.7.3.3.2 Use a sewer listening device where sewer lines are not physically exposed. If Operator detects an anomaly that indicates sewer line penetration, then Operator must stop work and notify the PG&E Representative to further identify the anomaly.

7.1.7.3.3.2.1 Contractor shall be responsible for obtaining and documenting camera inspection services and/or audio imaging services to verify sewer mains or laterals. When special audio visual services are required for verification of sewer mains and laterals, PG&E shall reimburse Contractor for the cost of obtaining such services on a cost-plus fee basis per General Conditions. Contractor shall supply PG&E Representative with copies of all camera inspection and/or audio imaging services.

7.1.7.4 Contractor shall keep the PG&E Representative informed as to the progress on bores and shall submit to PG&E an "as-built" drawing showing all substructures and clearances at crossing locations.

7.1.7.4.1 While prospecting, Contractor is responsible for developing and maintaining a pre-bore path log that describes location, footages and dimensions of the existing facilities in accordance with Section 5 Paragraph 7.3.1.1 of these Specific Conditions. The Pre Bore Path Log will also indicate proposed clearances between facility to be installed and existing facility crossings.

7.1.7.4.2 At the end of each workday, Contractor shall provide PG&E with a list of all substructures prospected. For each substructure that is exposed, the following information is required:

7.1.7.4.2.1 Type of substructure, i.e. Sewer or Telephone.

7.1.7.4.2.2 Location of prospect hole from property and/or



- centerlines in two directions, which intersect perpendicularly.
- 7.1.7.4.2.3 Cover over each substructure, measured from existing surface.
- 7.1.7.4.2.4 Size of each substructure, in terms of the outside diameter.
- 7.1.7.4.2.5 Material of each substructure.
- 7.1.7.4.2.6 Alignment or orientation of each substructure in both a horizontal and vertical direction.
- 7.1.7.4.2.7 Soil conditions and thickness of pavement at each location.
- 7.1.7.4.3 During drilling operations visual inspection along the bore path of the alignment shall take place at all times. Contractor shall regularly provide the monitor with the following information throughout the entire HDD procedure:
 - 7.1.7.4.3.1 Position of the drill head in relation to the point of entry.
 - 7.1.7.4.3.2 Estimate of the volume of drilling fluid pumped during the drilling process, as compared to the volume of current returns.
 - 7.1.7.4.3.3 Abnormal-drilling fluid pressures at time of occurrence.
 - 7.1.7.4.3.4 Changes of drilling fluid contents.
 - 7.1.7.4.3.5 Actual clearance and all crossing locations.
- 7.1.8 Contractor shall pothole all existing infrastructure to be crossed during the bore to verify exact location and depth (show on as-builts). Contractor shall make changes to the plan, based on the results of the potholing program, or modify the HDD alignment, if such changes and modifications are approved in advance by PG&E, where it is practical and not determined to be a potential risk to the HDD operations or increase the likelihood of a frac-out.
- 7.1.9 Once utilities have been located, Contractor shall physically identify the exact location of the utilities by vacuum or hand excavation, when possible, in order to determine the actual location and path of any underground utilities which might be within twenty (20) feet of the bore path. Contractor shall verify drill stems or reamer assembly will clear other existing installed utilities by means of visual observation and confirmation. Contractor shall not commence boring operations until the location of all underground utilities within the work area have been verified.

7.1.10 BORING

- 7.1.10.1 Contractor shall continually monitor and record the location, alignment



and depth of the bore during the boring process and installation. Contractor shall track information on a Boring Log according to the requirements of this Section 5 Paragraph 7.3.

- 7.1.10.2 Contractor shall notify PG&E at once of any known or possible contact of the boring head with an existing substructure. Contractor shall immediately stop boring and notify the PG&E Representative of the possible obstruction. Contractor shall not continue boring until Contractor and PG&E have discussed the situation and reached a resolution to the problem. Contractor shall be held liable for any damage to an existing facility as a result of the boring process for a period of two (2) years following the completion of the Contract. "Existing Facilities" include, but are not limited to: sewer, storm drains, water, communication lines, traffic loops, electric utilities and landscaping.
- 7.1.10.3 Once pull-back operations have commenced operations must continue without interruption until conduit is completely pulled into borehole. During pull-back operations Contractor shall not apply more than the maximum safe pipe pull pressure at any time.
 - 7.1.10.3.1 In the event that conduit becomes stuck, Contractor shall cease pulling operations to allow any potential hydro-lock to subside and then commence pulling operations. If conduit remains stuck, Contractor shall notify the PG&E representative and Contractor shall discuss options, and then work will proceed accordingly.
- 7.1.10.4 Contractor shall continue to pull conduit until a minimum of ten (10) feet of the pipe can be inspected by the PG&E Representative.
 - 7.1.10.4.1 Conduit shall be installed free of gouges or scratches greater than ten percent (10%) of the wall thickness.
 - 7.1.10.4.2 Damaged Conduit: Any damage exceeding ten percent (10%) shall be removed by either pulling the damaged section out or by excavating and removing the damaged section. Costs of damaged conduit needing replacement shall be deducted from contractor's compensation.
 - 7.1.10.4.3 Backfilling shall be done with sand around all facilities installed. Pits must meet compaction requirements of jurisdictional agency at each location.

7.1.11 HANDLING PIPE

- 7.1.11.1 As provided in the Specific Conditions, Contractor or PG&E shall place the conduit on the rollers provided by Contractor. PG&E may elect to provide standby equipment to assist in guiding the pipe. Such assistance by PG&E does not relieve Contractor of the responsibility to ensure that the rollers are adequate and spaced properly and for the smooth, continuous, efficient pull of the conduit.
 - 7.1.11.1.1 Pipe Rollers: Pipe rollers shall be of sufficient size to fully support the weight of the conduit during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of conduit and shall be designed



and placed to avoid damage.

- 7.1.11.2 PULL-BACK: After successfully reaming the bore to the required diameter, the conduit shall be pulled through the bore path. Once the pullback operation has commenced, it shall continue without interruption until the conduit is completely pulled into bore unless otherwise approved by the PG&E Representative.
 - 7.1.11.2.1 Pull-back of the HDD string will be planned for and performed in a way that minimizes the possibility of heaving underground utilities or structures. Should pavement heaving or settlement occur, saw cutting and replacement of the pavement shall be the responsibility of Contractor.
- 7.1.11.3 PULLING LOADS: The maximum allowable tensile load imposed on the pull section shall be equal to seventy-five percent (75%) of the specified minimum yield strength of the conduit and the area of the conduit section.
 - 7.1.11.3.1 Contractor shall ensure working gauges, which register tensile loading, are accurate and operable.
- 7.1.11.4 TORSIONAL STRESS: A swivel shall be used to connect the pull section to the reaming assembly to minimize torsional stress imposed on the section.
- 7.1.11.5 After installation by HDD, the conduit will contract in length and is to be left free for a minimum period of 24 hours prior to joining or attachment to an end fitting or additional conduit.

7.1.12 CHANGE IN BORE HOLE DESIGN

- 7.1.12.1 As provided in Final Bore Hole Design of this Specification, Contractor may propose an alternate final borehole design, altering the exit location and angle if a more effective design is warranted and if such alternate is approved by PG&E prior to start of drilling activities.
- 7.1.12.2 Pilot Hole Quality Assurance: Contractor shall continually monitor the three-dimensional location of the bore. Contractor shall drill conduits according to the centerlines as shown on the final borehole design that has been approved by PG&E. Contractor shall submit the pilot-hole data on a daily basis to the designated PG&E Representative. The PG&E Representative will review the data daily to ensure the pilot hole is meeting all requirements of the final bore design. If an unacceptable deviation exists between the final bore design and the as-drilled pilot hole, Contractor may be directed to take corrective measures to ensure the pilot hole is in compliance. Once the pilot hole is completed, the pilot-hole as-built data will be submitted for PG&E approval and acceptance prior to start of back reaming operations. The designated PG&E Representative will review and accept or reject the as-installed pilot hole within two (2) hours of receiving data. If the data received is questionable, Contractor may be required to submit a detailed profile of the pilot hole showing actual trajectory at intervals not greater than the length of the drill stems used during actual drilling. In the event significant deviations exist that



exceed the tolerances of the requirements, Contractor shall abandon the pilot hole at Contractor's cost and install a new pilot hole at an agreed upon location that meets all project requirements.

7.1.12.3 Circulation and Drilling Fluids

7.1.12.3.1 Recirculation: Contractor shall maximize recirculation of drilling fluid surface returns. Contractor shall provide solids control and fluid cleaning equipment of a configuration and capacity that can process surface returns and produce drilling fluid suitable for reuse.

7.1.12.3.2 Segregation: Contractor shall containerize and segregate drilling fluids from native soil. Contractor shall not allow drilling fluids to migrate onto the soil. Contractor shall transport and dispose of the drilling fluids as necessary to avoid any overflow of such fluids onto the site.

7.1.12.3.3 Disposal: Contractor shall dispose of excess drilling fluids in compliance with all environmental regulations, right-of-way and workspace agreements, and permit requirements. Drilling fluid disposal procedures proposed for use shall be submitted to PG&E for approval.

7.1.12.3.3.1 No procedure may be used which has not been approved by PG&E. PG&E, at its option, may secure an excess drilling fluid disposal site for Contractor. If hazardous material sites occur along the bore path, drilling fluids may exceed threshold levels and could require handling and disposal as a hazardous waste.

7.1.13 BACK-REAMING

7.1.13.1 GENERAL: Operations that result in over-cutting of the borehole during the back reaming operation will be avoided to minimize the possibility of post-installation settlement of surface structures. Contractor shall remove uniform quantities of material with each pass while minimizing the down hole pressures that could lead to loss of circulation conditions.

7.1.13.1.1 Contractor shall enlarge the pilot hole by back-reaming in order to produce a clean, un-obstructed hole for the conduit to be pulled through.

7.1.13.2 Minimum horizontal and vertical clearances to existing facilities as specified in the Contract Documents shall be maintained. Clearances shall be measured from the nearest edge of the largest back-reamer required to the nearest edge of the facility being paralleled or crossed.

7.1.13.3 The drilling mud in the annular region should not be removed after installation, but permitted to solidify and provide support for the conduit and surrounding soil.

7.1.14 PRE-REAMING



Contractor shall conduct pre-reaming operations to ensure that a hole sufficient to accommodate the pull section has been produced. Any damage to the conduit resulting from inadequate pre-reaming shall be the responsibility of Contractor. The final hole shall be pre-reamed to an agreed upon diameter that will minimize pull forces required and prevent damage to the conduit but shall be at least 1.5 times the outside diameter of the product conduit.



7.1.15 QUALITY ASSURANCE

7.1.15.1 OPERATOR: Only trained and competent personnel shall operate the HDD system equipment.

7.1.15.1.1 Experience: Personnel shall be actively engaged in horizontal directional drilling for a minimum of three (3) years. Field Supervisory personnel shall be experienced in the performance of the work and tasks as stated herein for a minimum of three (3) years.

7.1.15.1.2 A competent and experienced supervisor of Contractor must be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual directional drilling operation. Contractor shall furnish a sufficient number of competent workers on the job at all times to ensure the directional drilling is made in a timely and satisfactory manner.

7.1.15.1.3 Contractor shall remove any personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project from the job site and replace with suitable personnel.

7.1.15.1.4 Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

7.1.15.1.5 Abandonment of Pilot Hole: If drilling is suspended during pilot hole drilling, Contractor shall execute the following general procedures:

7.1.15.1.5.1 Advancement of the drill string shall be halted.

7.1.15.1.5.2 Cement or Bentonite mixing and pumping equipment shall be mobilized to the drilling location and rigged up to the drill string.

7.1.15.1.5.3 Drill string shall be withdrawn and hole pumped with cement or industry-approved fill material to displace the Bentonite slurry material.

7.1.16 OPERATIONAL DATA AND LOGISTICAL DATA

7.1.16.1 Operational Data: Contractor shall at all times provide and maintain instrumentation which will accurately locate the pilot hole and, if required, measure drill string axial and torsional loads, and measure drilling fluid discharge rate and pressure. Contractor shall provide access to PG&E to these instruments and their readings at all times. A log of all recorded readings shall be maintained at the Work site and will become a part of the "as-built" information to be supplied by



Contractor.

- 7.1.16.2 Logistical Data: At the completion of pilot hole drilling, Contractor shall provide a tabulation of coordinates, referenced to the drilled entry point, which accurately describe the location of the pilot hole. This tabulation shall be in addition to the log of recorded readings required under "Operational Data".

7.2 PLANS & CONTINGENCIES

- 7.2.1 GENERAL PLANS: The following are general plans that will be provided by Contractor before work commences. PG&E's review and acceptance of all Contractor's plans, designs, and reports shall not relieve Contractor of the responsibility to perform and warrant the Work as provided therein.

- 7.2.1.1 MANAGEMENT PLAN: Prior to beginning work, Contractor shall submit a Management Plan, detailing equipment, personnel, procedures, and schedule. The Management Plan should be comprehensive, realistic, and based on actual working conditions for each project. The Management Plan shall include the following:

- 7.2.1.1.1 Equipment: Contractor shall submit specifications on directional boring equipment to be used to ensure that the equipment will be adequate to complete the project. Contractor is responsible for maintaining and providing an adequate inventory of spare parts that might become necessary for completion of the work.

- 7.2.1.1.2 Personnel:

- 7.2.1.1.2.1 List of personnel and their qualifications and experience (including back up personnel in the event that an individual is unavailable)

- 7.2.1.1.2.2 List of subcontractors

- 7.2.1.1.2.3 Outline of proposed division of responsibilities between Contractor and any proposed subcontractor

- 7.2.1.1.3 Procedure and Schedule:

- 7.2.1.1.3.1 Outline of proposed project management structure

- 7.2.1.1.3.2 Proposed and integrated schedule of detailed work activity and tasks in support of the HDD installation

- 7.2.1.1.3.3 Contractor shall ensure that all necessary permits and authorizations to conduct the HDD construction activities have been secured prior to starting work. Prior to starting work, the person responsible for performing these tasks will be identified in Contractor's Management Plan.

- 7.2.1.1.4 Contractor shall locate and acquire fresh water for the HDD installation. Contractor shall dispose of the water in



accordance with all federal, state and local laws, rules and regulations and any applicable landowner agreements.

- 7.2.1.2 **PRELIMINARY BOREHOLE DESIGN:** PG&E will develop a preliminary design for a proposed HDD installation for the purpose of feasibility assessment, planning the Work, and securing the required permits. Preliminary design will be based on actual line pipe to be used for proposed installation, plus a series of inferences about the direction of drilling, access to the entry and exit points, and the geometry of the HDD borehole. PG&E's permit applications state that these preliminary designs will be subject to change in the final design for the HDD borehole that will be submitted by Contractor selected by PG&E. Minor changes in the 'design' location of the entry and exit points for the HDD borehole may be negotiated with PG&E. All significant variables regarding the design of the HDD borehole, including the direction of drilling, entry and exit angles, the radius of borehole curvature, the borehole diameter, and the maximum borehole depth may be modified by Contractor based on its experience and judgment, to maximize the chances of a trouble-free and successful installation, if such modifications are approved by PG&E.
- 7.2.1.3 **FINAL BOREHOLE DESIGN:** Contractor's Proposed Final Borehole Design for the HDD borehole must be submitted to PG&E for review and approval prior to commencement of drilling of the pilot borehole. The design drawing shall include the following information:
 - 7.2.1.3.1 Anticipated entry and exit angles
 - 7.2.1.3.2 Drill path alignment (plan and profile views) identifying borehole depths at key locations, the location and length of proposed straight portions of the borehole, and the locations, lengths and radius of curvature of all curved segments of the borehole
 - 7.2.1.3.3 Locations and elevations of all buried utility and belowground structures crossing or in proximity to the HDD borehole and anticipated clearance dimensions
 - 7.2.1.3.4 Total underground, down hole length of the borehole along the proposed alignment, from entry to exit point
 - 7.2.1.3.5 Total straight-line, horizontal length of the borehole along the proposed alignment, from entry to exit point
 - 7.2.1.3.6 Anticipated final borehole diameter prior to pulling in the conduit string
 - 7.2.1.3.7 Finalized temporary workspace requirements based on the final plan for fabricating the conduit string in segments, or in its entirety
 - 7.2.1.3.8 Location of PG&E permanent easement
- 7.2.1.4 Contractor's proposed Final Borehole Design may need to be based on a structural analysis of the conduit during the HDD installation process. If required, the analysis and design will demonstrate and support how much estimated total maximum pull-back force is required



during the installation. Analysis, design, and equipment will also provide for the following during installation:

- 7.2.1.4.1 Stresses in the HDD pipe string of the diameter, wall thickness, and grade specified by PG&E will remain within acceptable and prudent limits during conduit installation.
 - 7.2.1.4.1.1 A "weak link" shall be utilized consisting of a one (1) foot section of pipe, two (2) diameters smaller than the pipe to be pulled. The weak link shall be attached to the pulling head and fused to the pipe to be pulled.
 - 7.2.1.4.1.2 HDD rig proposed for the installation shall have a prudent factor of safety with regard to its rated capacity in comparison with the maximum estimated force.
- 7.2.1.5 BORING PLAN: Prior to commencement of drilling, Contractor shall submit a Boring Plan that describes the following:
 - 7.2.1.5.1 Anticipated rig capacity
 - 7.2.1.5.2 Proposed equipment and method for advancing the borehole through expected soil conditions, angles, depth, exact location on the exit ditch and the pilot hole diameter.
 - 7.2.1.5.3 Proposed reaming plan including the number and diameter of pre-reams/back-reams and diameter of the final reamed borehole
 - 7.2.1.5.4 Contingency equipment and plans for dealing with soil conditions that a soils engineer could reasonably expect to be encountered at the proposed HDD installation site
 - 7.2.1.5.5 Anticipated hours of operation during the HDD borehole drilling and installation process
 - 7.2.1.5.6 Minimum number of personnel, and their responsibilities, on-duty and on-site during all HDD drilling operations
 - 7.2.1.5.7 Finished grade, deflection, and radiuses of the pilot bore
 - 7.2.1.5.8 All existing utilities with minimum vertical and horizontal clearances
 - 7.2.1.5.9 Location of the drill rig set ups
 - 7.2.1.5.10 Lengths of each bore (if there are multiple bores) based on soil condition, equipment, and topography etc.
 - 7.2.1.5.11 Contractor shall submit the Boring Plan for PG&E's review and approval prior to mobilization.



- 7.2.1.5.12 Proposed vertical and horizontal clearances between the bored conduit and any existing proposed conflicting pipes, conduits, or obstructions must exceed any Magnetic Guidance System accuracy tolerance by a minimum of 100% or as specified in this Contract (Section 5, Paragraph 4.1.6 of the Specific Conditions) or by a safe and prudent distance whichever is greater.
- 7.2.1.6 **DRILLING FLUIDS PLAN:** Contractor shall submit a written Drilling Fluid Plan to PG&E for approval, prior to commencement of drilling operations. The plan must provide for anticipated soil and rock conditions, fluid selection, drill bit and reamer selection, and include volume calculations. It will define the proposed viscosities for soil transportation to the entry and exit pits. The plan will include MSDS for all proposed and anticipated mud mixes and fluid additives. It will address estimated pumping capacity and pressures. It will identify the source of fresh water for mixing the drilling mud. Contractor shall secure the required agreements and permits to procure needed fresh water.
- 7.2.1.6.1 The Drilling Fluid Plan will address Contractor's plans for a tail ditch and/or mud recirculation pits, and shoring, if required. It will address the use of small earthen berms, or other measures proposed to contain mud overflow from the pits. It will address safety measures required for personnel working in the vicinity of these mud recirculation pits. The Drilling Fluid Plan will provide for disposal of excess drilling fluids in accordance with all federal, state and local, laws rules and regulations and applicable landowner agreements.
- 7.2.1.6.2 Contractor shall have a Drilling Fluid Engineer on site during all boring operations and shall perform the following tasks:
- 7.2.1.6.2.1 First indication that a frac-out may have occurred is a reduction or stoppage of mud returns in the entry-side mud-pit. The Drilling Fluid Engineer is responsible for continuously monitoring drilling fluid returns. If a reduction or stoppage is observed, mud circulation and drilling operations must be arrested until the cause of the loss of returns is determined and corrected.
- 7.2.1.6.2.2 Drilling Fluid Engineer is responsible for monitoring the drilling, fluids, such as pumping rate, pressures, viscosities, and density during the pilot bore and back reaming, and the pipe installation process, ensuring adequate cuttings removal, and maintaining the stability of the borehole is maintained.
- 7.2.1.6.2.3 Entry and exit pits should be of sufficient size to contain the expected return of drilling fluid



and soils cuttings during the entire drilling reaming and pullback operations. They will be maintained and deepened, and re-shored as necessary, as required during the installation process.

- 7.2.1.6.2.4 When applicable, Contractor shall segregate drilling fluids from native soil, and contain the cuttings for disposal, in the method outlined and approved in Contractor's Drilling Fluid Plan. Contractor shall transport and dispose of excess drilling fluids as necessary to avoid any overflow of such fluids onto the site.

7.2.1.7 COMMUNICATION PLAN

- 7.2.1.7.1 Contractor shall submit a detailed Communications Plan that clearly shows the names and phone numbers of all PG&E personnel and Agency / Regulatory entities that are to be notified if a significant adverse event occurs while drilling.

7.2.1.8 SAFETY PLAN

- 7.2.1.8.1 Contractor shall ensure that safe working procedures and conditions are maintained. Contractor shall provide HDD installation site Safety Plan after award of each HDD installation contract.
- 7.2.1.8.2 Safety meetings shall be conducted at least daily with a written record of attendance and topics documented and submitted to the PG&E Representative on site.

7.2.2 IF REQUIRED PLANS: The following plans shall be provided by Contractor if the plans are required by local, state, and/or federal jurisdictional agencies. The following plans may also be unique and job specific in response to the work. Contractor shall make adjustments as required on a case-by-case basis.

7.2.2.1 SOIL ANALYSIS: Contractor shall provide soil analysis as required by the permit.

- 7.2.2.1.1 In areas where extremely sensitive conditions exist, such as drilling under levees or aqueducts, PG&E may require detailed analysis of expected soil conditions along the approved borehole path, and structural calculations of the expected hydro-fracture pressures along the path of the HDD borehole. PG&E will then require Contractor to implement a program to limit mud circulation pressures to remain below the calculated hydro-fracture pressures.

7.2.2.2 SITE ACCESS PLAN: Contractor will submit a proposed HDD Site Access Plan, defining Contractor's plans for accessing the temporary workspace required for the HDD installation, with the required equipment and support facilities. Contractor shall secure adequate temporary workspace for the HDD drilling and installation process, as well as for the fabrication of the HDD pipe string. Contractor shall review the proposed workspace prior to starting any work.



- 7.2.2.3 SUBMITTALS: Prior to start of work, Contractor shall provide a submittal with the following information to support PG&E's permit application:
- 7.2.2.3.1 Location of entry and exit point
 - 7.2.2.3.2 Equipment and pipe layout area
 - 7.2.2.3.3 Proposed Drill Path Alignment (both plan and profile view)
 - 7.2.2.3.4 Location, elevations, and proposed clearances of all utility crossings and structures
 - 7.2.2.3.5 Proposed Depth of Cover
 - 7.2.2.3.6 Soil Analysis
 - 7.2.2.3.7 Product material (HDPE/steel), length, diameter-wall thickness, reamer diameter
 - 7.2.2.3.8 Proposed composition of drilling fluid based on soil analysis viscosity and density
 - 7.2.2.3.9 Drilling fluid pumping capacity, pressures and flow rates proposed
 - 7.2.2.3.10 State right-of-way-lines, property, and other utility right-of-way or easement lines
 - 7.2.2.3.11 Elevations
 - 7.2.2.3.12 Type of tracking method/system
 - 7.2.2.3.13 Survey Grid establishment for monitoring ground surface movement (settlement or heave) due to drilling operation
- 7.2.2.4 Contractor shall keep the PG&E Representative informed as to the progress on bores and shall submit to PG&E an "as-built" drawing showing all substructures and clearances at crossing locations.
- 7.2.2.5 Contractor, prior to commencement of the directional drill, will establish a Survey Grid Line and provide a program of monitoring the actual location of the borehole during drilling operations, at all times providing and maintaining instrumentation which will accurately locate the following: the pilot hole, the geodetic position of the new conduit in a manner that can be reproduced during subsequent surveys, the angles of entry and exit, the conduit stationing and elevations, vertical and horizontal radius of curvature, and PG&E permanent easements.
- 7.2.2.6 STORM WATER POLLUTION PREVENTION PLAN (SWPPP): Contractor shall comply with the project-specific Storm Water Pollution Prevention Plan (SWPPP) if a SWPPP is provided by PG&E and dispose of all drilling fluids in accordance with federal, state and local laws, rules and regulations as well as any applicable landowner agreements. Contractor shall maintain erosion control materials (silt



fence, hay bales, etc.) on site, as required to contain an inadvertent release of all drilling fluids.

- 7.2.3 GENERAL CONTINGENCY PLANS: Contractor shall develop general contingency plans and made available to PG&E before any work commences.

7.2.3.1 UNSUCCESSFUL DRILL

7.2.3.1.1 Failed Pilot Hole or Pull Back: At PG&E's sole discretion, Contractor may be allowed to make three separate attempts to complete the pilot hole and install the conduit. Additional locations for alternate pilot holes, entry points and exit points constitute a new design and must be approved by PG&E prior to start of drilling. At PG&E's sole discretion, after the third attempt the project will be classified as a failure.

7.2.3.1.2 Conduit Failure: Contractor shall pull the entire length of conduit back through the completed bore. In the event any portion of conduit should fail during Contractor's pull of the conduit, such conduit failure shall be considered a bore failure.

7.2.3.1.2.1 Contractor shall install the pull section in the reamed hole in such a manner as to ensure that external pressures are minimized and an appropriate counter-balancing internal pressure is maintained. In the event the pipe is damaged as a result of external pressure during installation, Contractor shall repair such damage at no additional cost to PG&E.

7.2.3.2 HOLE ABANDONMENT

7.2.3.2.1 If drilling is suspended during pilot hole drilling, Contractor shall execute the following general procedures:

7.2.3.2.1.1 Advancement of the drill string shall be halted.

7.2.3.2.1.2 Cement or Bentonite mixing and pumping equipment shall be mobilized to the drilling location and rigged up to the drill string.

7.2.3.2.1.3 Drill string shall be withdrawn and hole pumped with cement or industry-approved fill material to displace the Bentonite slurry material.

7.2.3.2.1.4 In the event that Contractor cannot successfully complete a bore, Contractor shall remove any conduit installed (if possible), abandon the incomplete bore hole and any conduit that cannot be removed and fill in any abandoned hole or pipe greater than (2) two-inch diameter.

7.2.3.3 ABANDONMENT DURING REAMING



- 7.2.3.3.1 If drilling is suspended during the reaming of the hole, Contractor shall execute the following general procedures:
 - 7.2.3.3.1.1 Pull back of the reaming string shall be halted.
 - 7.2.3.3.1.2 Cement or Bentonite mixing and pumping equipment shall be mobilized to the drilling location and rigged up to the drill string.
 - 7.2.3.3.1.3 If possible, the reamer would be replaced with a cementing head.
 - 7.2.3.3.1.4 Drill string shall be withdrawn and the hole pumped with grout or industry-approved fill material to displace the slurry material and prevent future subsidence.
- 7.2.3.4 IF REAMER COULD NOT BE PUSHED BACK TO EXIT END, THEN
 - 7.2.3.4.1 Drill string shall be withdrawn and the hole pumped with cement or industry approved fill material to displace the slurry material.
 - 7.2.3.4.2 Drilling rig shall be rigged down at entry end and rigged up at exit end.
 - 7.2.3.4.3 Run in pilot-hole with cement head on pilot-hole drill string until previously cemented reamed hole is pumped.
 - 7.2.3.4.4 Drill string shall be withdrawn and hole pumped with cement or industry approved fill material to displace the slurry material.
- 7.2.3.5 ABANDONMENT CONTINGENCY PLAN (ACP)
 - 7.2.3.5.1 After containment and notification steps have been taken, PG&E management, drilling engineer, district engineer, or other third party facility owners' representative will evaluate the feasibility of continuing the boring process. At that time it will be decided whether to continue with the bore or implement the Abandonment Contingency Plan (ACP) after evaluating the following:
 - 7.2.3.5.1.1 The exact location of the drilling head assembly will be verified with portable locating equipment. If it is determined that the drilling profile does not match the planned profile, and exceeds design limits, the ACP will be implemented.
 - 7.2.3.5.1.2 If the location and profile are within design limits, the specific weight of the drilling mud will be verified to ensure a slightly overbalanced condition to the surrounding formation. The specific weight will be adjusted as necessary.



- 7.2.3.5.1.3 If location, profile, and drilling mud weight are determined to be within design limits, and frac-out of slurry is controlled, Contractor may be permitted to proceed.
 - 7.2.3.5.1.4 Should it be determined that the stability of the bored crossing is in serious question, even if location, profile, and drilling mud weight are deemed satisfactory, the ACP will be implemented.
- 7.2.3.6 HAZ-MAT SPILL CONTINGENCY PLAN
 - 7.2.3.6.1 Shall include preparations for a quick and safe cleanup of accidental spills.
 - 7.2.3.6.2 Shall prescribe the procedures for reducing the potential for a spill during construction and will include an emergency response program.
 - 7.2.3.6.3 The plan shall identify areas for refueling and vehicle maintenance activities and storage of hazardous materials, if any, will be permitted.
- 7.2.3.7 FRAC-OUT EQUIPMENT BREAK DOWN AND REPAIRS PLAN
 - 7.2.3.7.1 Some loss of returns may be inevitable as drilling fluids are absorbed by the lateral and subterranean fractures within the substrates. A complete and sudden loss of returns serves as a signal to both the operator and the monitor that something more significant may be occurring and to watch closely for a possible surface release.
 - 7.2.3.7.2 In the event of a frac-out, PG&E Representative has the authority to halt all operations until appropriate procedures are implemented.
 - 7.2.3.7.3 In the event of a frac-out, Contractor shall be responsible for coordinating with all appropriate agencies and subcontractors, if necessary for thorough and complete clean-up of the affected site.
 - 7.2.3.7.4 Upon detection of a terrestrial or aquatic frac-out, the following plan of action shall be placed in effect:
Directional boring shall stop immediately and the drill head shall be pulled back to relieve pressure on the frac-out. For terrestrial frac-outs in the project area, an earth berm will be constructed around it for containment. On-site materials consisting of industrial grade PVC mesh with steel T-posts and natural straw bales may also be installed around the frac-out areas to contain the fluid.
 - 7.2.3.7.5 For frac-outs occurring beneath a waterway, any individual or combination of the following approaches may be used to contain the drilling fluid:
 - 7.2.3.7.5.1 A sand bag berm surrounding the frac-out area (effective at water's edge situations)